

AERO Design Ltd.

ENGINEERING REPORT

ER493.04

EXTERNAL ATTACHMENT PROVISIONS

BARREL NUT RETAINER

BELL 206B, 206L, 407

Prepared by: Jeff Clarke

Approved by: E. Burgoin, P.Eng., DAR 290M

Revision 0

Date: 01 May 2012

AERO Design Ltd.
Engineering Consultants
www.aerodesign.ca

2013 – 39th Avenue N.E., Calgary, Alberta T2E 6R7
Phone: (403) 250-8027
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1.0 INTRODUCTION

Operators using the landing gear attachment fittings on Bell 206B, 206L and 407 models of helicopter have reported instances where the barrel nuts have been forgotten to be removed from the landing gear attachment fittings when the cargo basket mounting beams were removed, and subsequently lost. Loss of the barrel nuts is at minimum an inconvenience but also has safety implications such as FOD or injury when the barrel nut leaves the fitting.

To prevent loss of the barrel nuts, provisions are added to the fittings to retain the barrel nuts inside the fittings when the fastener is removed.

2.0 REFERENCE TEXT

AERO Design Ltd. Drawings

49311, Revision 5, Bell 206L Forward Landing Gear Fitting

49312, Revision 5, Bell 206L Aft Landing Gear Fitting

49721, Revision 2, Bell 206B Forward Landing Gear Fitting

60621, Revision 3, Bell 407 Forward Landing Gear Fitting

AERO Design Ltd. Reports

Engineering Report ER493.01, Revision 1, Bell 206L External Attachment Provisions

Engineering Report ER497.01, Revision 0, Bell 206B External Attachment Provisions

Engineering Report ER606.01, Revision 0, Bell 407 Side Mounted Cargo Basket

3.0 BASIS OF CERTIFICATION

Bell 206B: H-92

CAR 6 dated December 20, 1956, Amendments 6-1 thru 6-4, CAR 6.307(b) and 6.637 of Amendment 6-5, Special Conditions dated October 2, 1962, as revised February 8, 1966.

Bell 407, TCDS H-92 (highest of 206L series and 407):

FAR part 27, dated October 2, 1964 Amendment 27-1 through 27-30; Paragraph 27.561(b)(3) at Amdt 27-24; Section 27.563 at Amdt. 27-25; Section 27.785 at Amdt 27-24; Section 27.1093 at amendment 27-8; and Section 27.173 and 27.175 at amendment 27-1.

Exemptions to FAR 27 are the deletion of sections: 27.562, 27.1195, and 27.952(b)(1).

This installation:

Same as the basis of certification for the models shown above, as indicated on the Supplemental Type Certificates SH00-48 and SH09-5.

4.0 STRUCTURAL COMPLIANCE

The modification to retain the barrel nut consists of adding a flange to one side of the barrel nut hole and a slot for a retainer ring in the other side.

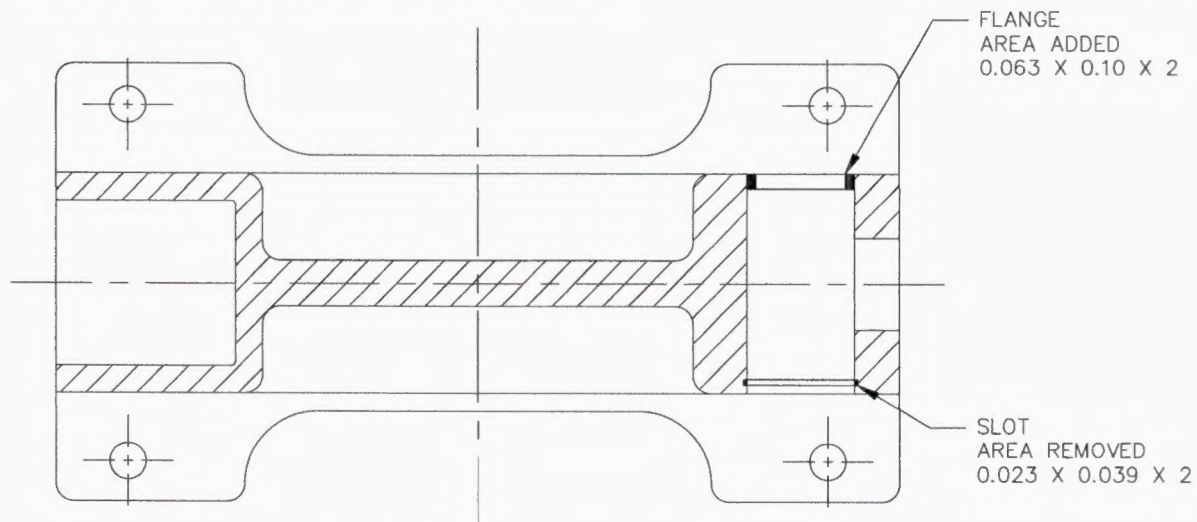


Figure 4.0.1 – Landing Gear Fitting Section Through Barrel Nut Hole
(49311-01 shown, all other similar)

Area added = 0.063 in x 0.1 in x 2

Area added = 0.0125 in²

Area removed = 0.023 in x 0.039 in x 2

Area removed = 0.0018 in²

The material added and removed to incorporate this modification is very small, but more material is added than removed. Structural strength of the fitting is not reduced from the existing type approved configuration.

The slot accommodates a standard internal retainer ring for a $\frac{3}{4}$ " bore, part number MS16625-4075. This part is stainless steel given the location of the part is outside in the elements.

This configuration of barrel nut hole is identical on the following part numbers and may be incorporated into each:

49311-01 Bell 206L Forward Fitting

49312-01 Bell 206L Aft Fitting

49721-01 Bell 206B Forward Fitting

60621-01 Bell 407 Forward Fitting

Steven Fahey

From: "Steven Fahey" <steve@aerodesign.ca>
To: "Ken Fraser" <ken@canamaerospace.com>
Sent: Friday, July 11, 2008 10:33 AM
Attach: DCN_49311_R4_SaddleSize2.5.pdf
Subject: Drawing Change Notice

Ken,

We have been getting feedback from customers, and it will make the saddle fit better on the landing gear cross-tubes if we change the diameter of the saddle curve.

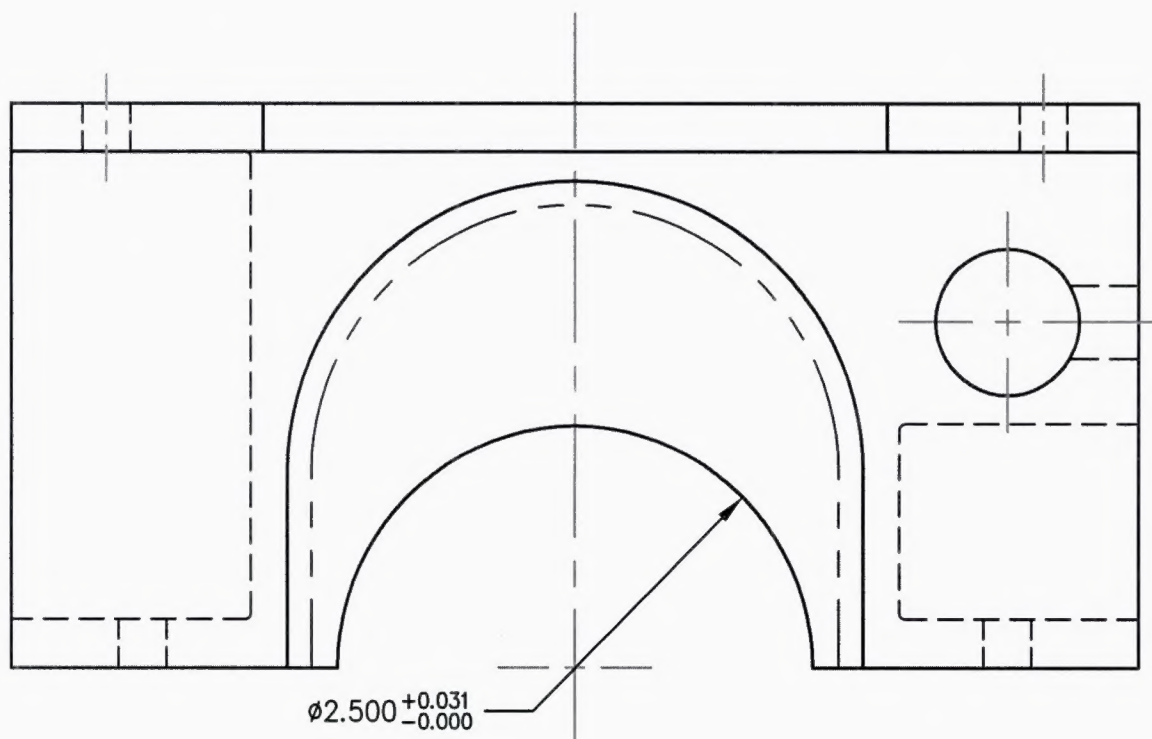
I have attached a Drawing Change Notice showing the changed dimension.

Steven Fahey, CET
steve@aerodesign.ca
Aero Design Ltd.
2013 - 39th Ave. NE
Calgary, AB
(403) 250-8027 (phone)
(403) 250-8333 (fax)

7/15/2008

CHANGES:

1. SADDLE DIMENSION WAS 2.437"
SADDLE DIMENSION IS 2.500"



① FORWARD FITTING

APPROVALS		DATE		<div>AERO DESIGN LTD.</div> <div>CONSULTING ENGINEERS, TRANSPORT CANADA APPROVALS, DAR 290M</div> <div>2013 - 39TH AVENUE N.E., CALGARY, ALBERTA, CANADA, T2E 6R7</div> <div>tel: (403) 250-8027 fax: (403) 250-8333 www.aerodesign.ca</div>							
DRAWN: S. FAHEY		JUL11/08									
CHECKED: E. BURGOIN		JUL11/08									
<div>UNLESS OTHERWISE SPECIFIED</div> <div>DIMENSIONS ARE IN INCHES.</div> <div>TOLERANCES ON:</div> <div>DECIMALS ANGLES</div> <div>X.XXX ±0.010 ±1/2°</div> <div>X.XX ±0.03</div> <div>X.X ±0.1</div>				<div>DRAWING CHANGE NOTICE</div> <div>THE CHANGES INDICATED ARE APPLICABLE TO THE INITIAL ISSUE AND/OR TO PREVIOUS DRAWING</div> <div>CHANGE NOTICES FOR THIS DRAWING AND SUPERCEDE THE INFORMATION FROM THE INITIAL ISSUE</div> <div>OF THE DRAWING AND/OR ANY EARLIER DRAWING CHANGE NOTICES.</div> <div>THIS DRAWING CHANGE NOTICE MUST ACCOMPANY THE DRAWING TO WHICH IT APPLIES AT ALL TIMES.</div>							
				SCALE 1 : 1		DWG. SIZE		DWG. NO.		REV.	CHG.
				SHEET 1 OF 1		A4		49311		3	A

AERO Design Ltd.

**SERVICE INSTRUCTIONS
SI 493.91**

EXTERNAL ATTACHMENT PROVISIONS

SHIM PROCEDURE

Bell 206L Series, 407

Revision 0
Date: 10 November, 2006

AERO Design Ltd.
Engineering Consultants

2013 – 39th Avenue N.E., Calgary, Alberta T2E 6R7
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1.0 INTRODUCTION

New installation of cargo baskets and equipment have been found to be particularly sensitive to the angle of the mounting provisions. These instruction provide the procedure to shim the landing gear fittings to correct misalignment.

2.0 REFERENCE

AERO Design Ltd. Drawing 49301, 60602

3.0 GENERAL INFORMATION ABOUT SHIMS

The shims provided are per MIL-DTL-22499/1B. They are made of plies of aluminum laminated together into a sheet. Layers are cut and peeled away in increments to taper the shim. The procedure of cutting and peeling the layers is somewhat difficult, so care should be taken when preparing the shims.

4.0 PROCEDURE

The following instructions reference the quick release cargo basket installation. Procedure is similar for any other equipment using the external attachment provisions.

1. Bell 206L Series: Install the forward and aft landing gear fittings in accordance with drawing 49301 and ICA493.90

Bell 407: Install the forward landing gear fittings and aft blocks in accordance with drawing 60602 and ICA700.90 (Bell 407).
2. Install mounting beams for quick release cargo basket in accordance with drawing 70101 (Bell 407) or 70201 (Bell 206L Series) and ICA698.90.
3. Set basket in upper slots on beams. Check if the lower attachment lug is aligned with the keyway at the bottom of the beam. If the lower lugs can enter the keyway and slide into the slot then shims are not required.
4. Measure deviation of centre of lug on basket to centre of slot. Any deviation over $\frac{1}{4}$ " is too far to shim. Contact AERO Design Ltd. for further instructions.
5. Fabricate shim as shown in the figures in Section 5 based on the deviation noted above. Use Section 6 for aft blocks on Bell 407.
6. Remove landing gear fittings (or blocks), insert shims and reinstalling landing gear fittings.
7. Repeat steps 3 and 4. If lower lugs on basket can enter keyway, shim is acceptable.

If further adjustment is required, carefully sand surface with 100 grit or finer emery paper down the angle of the shim. Do not sand up the angle as the shim may delaminate.

5.0 SHIM TEMPLATES - FITTINGS

Material: Shim 49321-01, 0.125" shim stock, 0.003" plies.

The taper is determined by the deviation measured in step 4 above. Use the table below to determine the correct template.

Deviation	# Divisions	Layers/Division	Figure
1/32	6	1	1
1/16	11	1	2
3/32	8	2	3
1/8	11	2	2
5/32	9	3	4
3/16	11	3	2
7/32	10	4	5
1/4	11	4	2

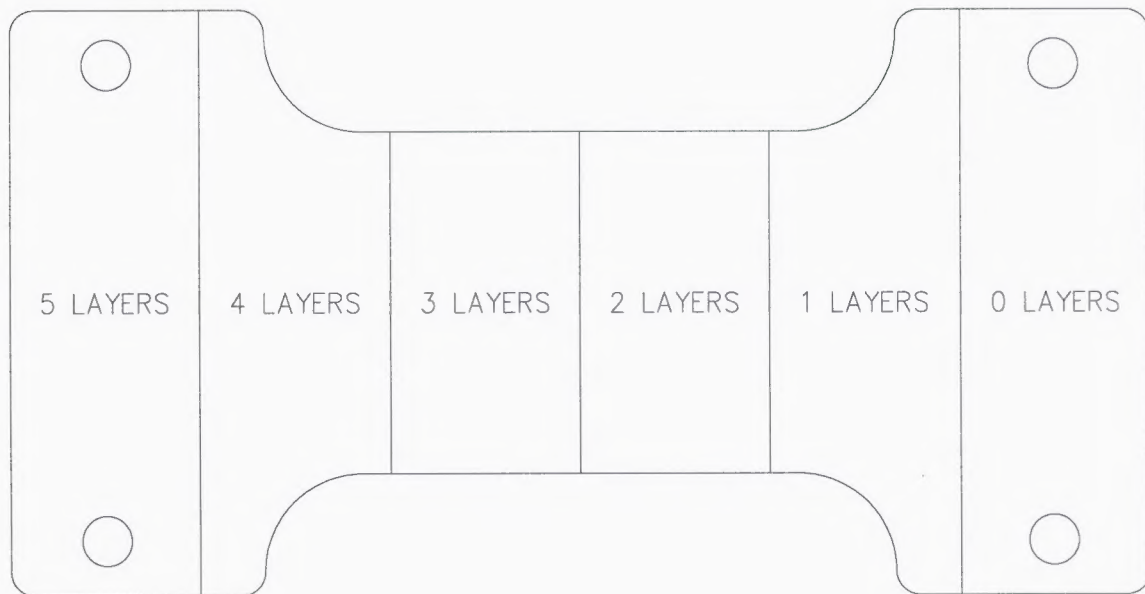


Figure 1 – 6 Divisions
(~1" per division)

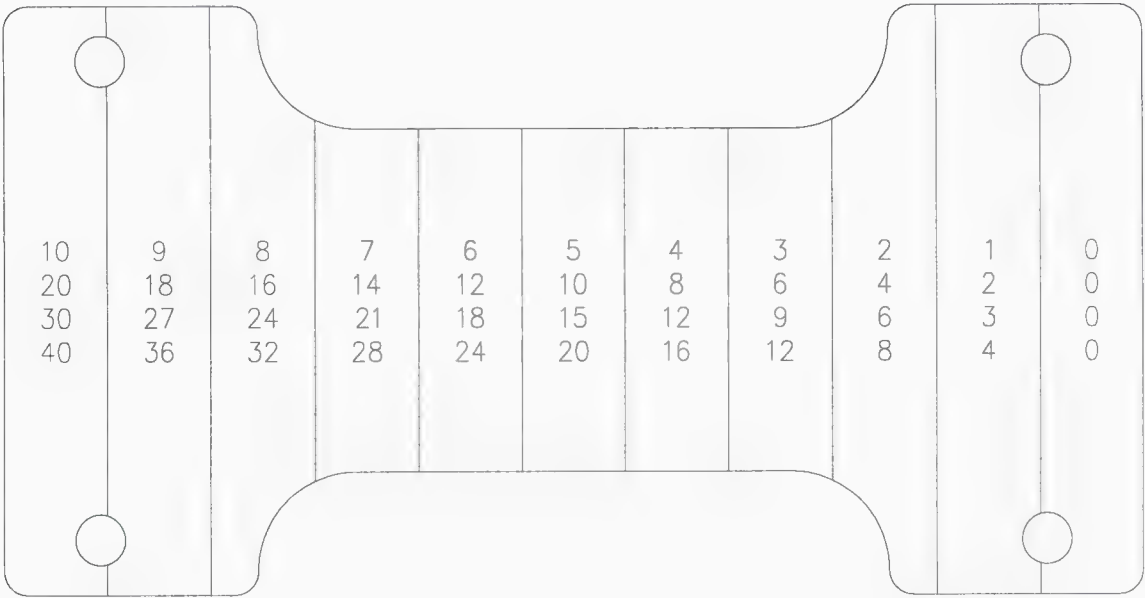


Figure 2 – 11 Divisions
(~1/2" per division)

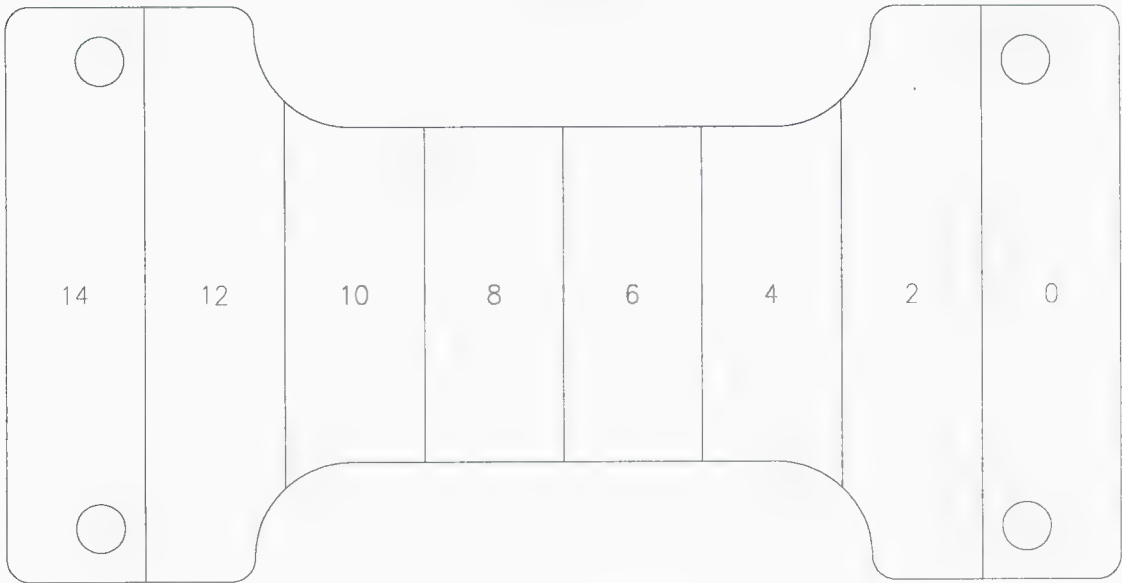


Figure 3 – 8 Divisions
(~3/4" per division)

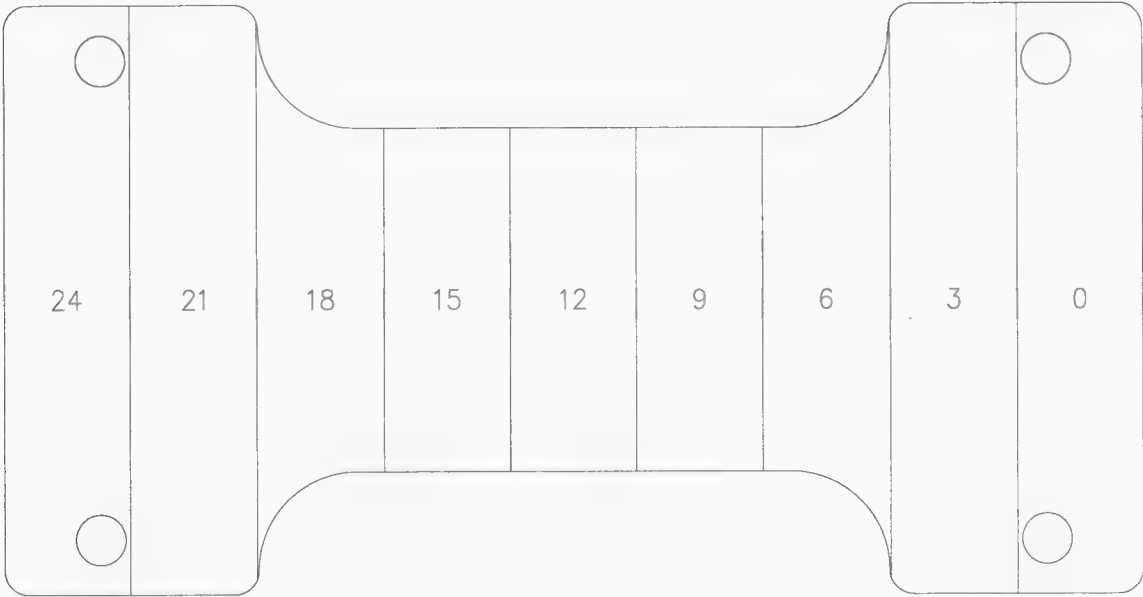


Figure 4 – 9 Divisions
(~5/8" per division)

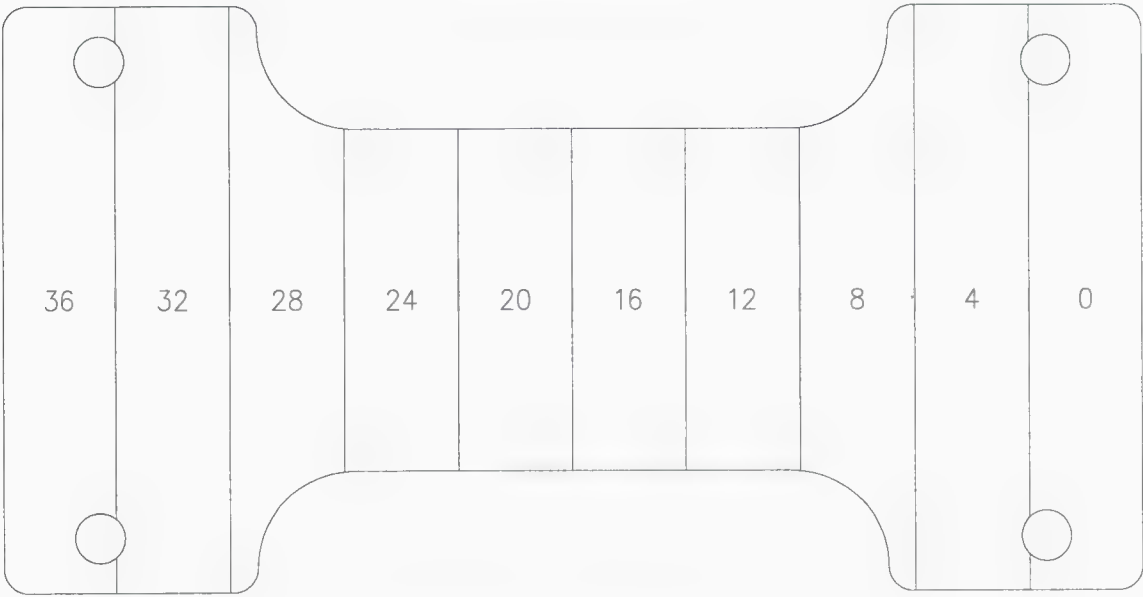


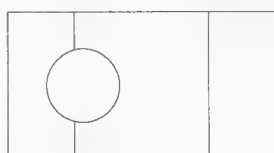
Figure 5 – 10 Divisions
(~9/16" per division)

6.0 SHIM TEMPLATES - BLOCKS

Material: Shim 70020-01, 0.063" shim stock, 0.002" plies.

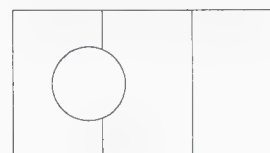
The taper is determined by the deviation measured in step 4 above. Use the table below to determine the correct template.

Deviation	# Divisions	Layers/Division	Figure
1/32	3	1	6
1/16	3	2	6
3/32	3	2	7
1/8	4	2	8
5/32	5	2	9
3/16	6	2	10
7/32	7	2	11
1/4	4	4	8



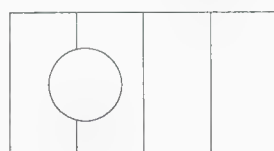
0 1 2
0 2 4

Figure 6 – 3 Divisions
(~11/32" per division)



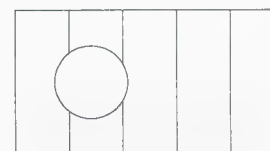
0 2 4

Figure 7 – 3 Divisions
(~15/32" per division)



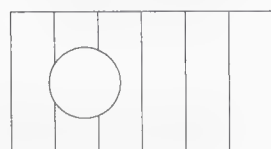
0 2 4 6
0 4 8 12

Figure 8 – 4 Divisions
(~11/32" per division)



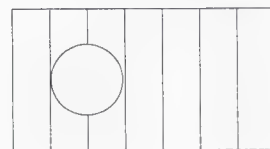
0 2 4 6 8

Figure 9 – 5 Divisions
(~9/32" per division)



0 2 4 6 8 10

Figure 10 – 6 Divisions
(~7/32" per division)



0 2 4 6 8 10 12

Figure 11 – 7 Divisions
(~3/16" per division)

Note: The taper will depend on the direction of the deviation of the beam.

INCH-POUND

MIL-DTL-22499/1B

27 February 1998

SUPERSEDING

MIL-S-22499/1A

20 May 1993

DETAIL SPECIFICATION SHEET

SHIM STOCK, LAMINATED, ALUMINUM ALLOY

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirement for acquiring the product described herein shall consist of this specification sheet and the issue of the following specification listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation: MIL-DTL-22499.

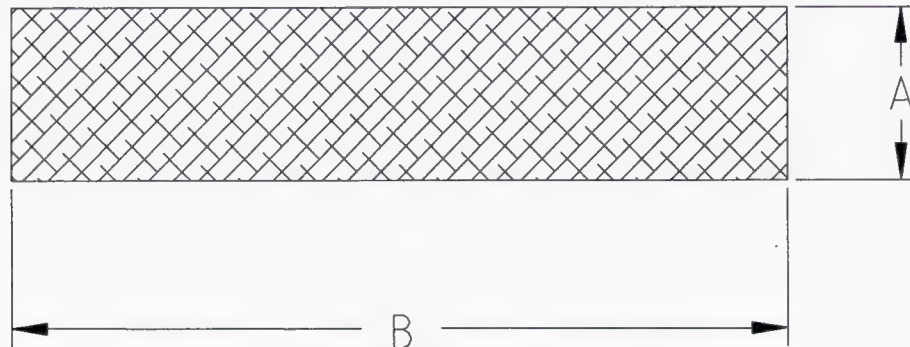


FIGURE 1. BAR, METAL, FLAT

NOTE: All dimensions are in inches.

Requirements

1. Material: Aluminum alloy as specified in procurement document.
2. Types:
 - I - All laminations.
 - II - One-half solid stock.

- Classes:
1. - .002 inch laminations.
 2. - .003 inch laminations.

3. Part Numbers: The part number consists of M22499/1 the basic number of this specification sheet and a dash number taken from Table I.

AMSC N/A
DISTRIBUTION STATEMENT A.

1 of 2
Approved for public release; distribution is unlimited.

FSC 9535

TABLE I

DASH NO.	A THICKNESS	B WIDTH	LENGTH FEET	TYPE	CLASS
001	0.006	20.000	4.000	I	1
003	0.006	20.000	4.000	I	2
005	0.015	6.000	3.000	I	2
007	0.016	24.000	4.000	I	2
009	0.021	24.000	4.000	I	2
011	0.024	8.000	2.000	I	1
013	0.030	10.000	1.667	I	1
015	0.032	24.000	4.000	I	1
017	0.032	24.000	4.000	I	2
019	0.032	24.000	4.000	II	2
021	0.033	24.000	4.000	I	2
023	0.040	24.000	4.000	I	2
025	0.048	24.000	4.000	I	2
027	0.048	24.000	4.000	II	2
031	0.062	10.000	1.667	II	2
033	0.062	24.000	4.000	I	1
035	0.065	24.000	4.000	II	2
037	0.066	24.000	4.000	I	1
039	0.092	24.000	4.000	II	2
043	0.093	12.000	4.000	I	2
045	0.093	24.000	4.000	II	2
047	0.094	24.000	4.000	I	1
049	0.094	24.000	4.000	I	2
051	0.100	24.000	4.000	I	2
055	0.120	24.000	4.000	II	2
057	0.125	24.000	4.000	I	1
059	0.125	24.000	4.000	I	2
061	0.132	24.000	4.000	II	2
063	0.150	24.000	4.000	I	2
067	0.187	24.000	4.000	I	2
069	0.190	24.000	4.000	II	2
071	0.190	24.000	4.000	I	2
074	0.200	24.000	4.000	II	2
075	0.250	20.000	4.000	I	2
077	0.250	24.000	4.000	I	2
079	0.250	24.000	4.000	I	1

Custodians:

Army - MR

Navy - AS

Preparing Activity:

DLA-IS

Review Activities:

Army - AR, AT, EA, CR4, MI

Navy - MC

DLA - CC

(Project 9535-0623-01)

Address:

Omega Helicopters
4360 Agar Drive,
Vancouver International Airport
Richmond, BC, V7B 1A3

Attention:

Kelly / Jordan

Phone #:

(604) 273-5312

We hereby declare that the parts supplied herein do conform with the referenced drawings. Use and installation of the parts may require further approval, and shall also comply with applicable airworthiness standards.

S. MAIER

Signature

Product: 407 LANDING GEAR FITTINGS

Reference: Your Purchase Order #:

2014

Parts and Assemblies Included with this Shipment:

Quantity Ordered	Quantity Shipped	Part Number	Description	
2	2	60621-01	Forward Landing Gear Fittings	✓
2	2	60620-01	Aft Landing Gear Blocks	✓
2	2	49320-01	Barrel Nut	✓
2	2	60622-01	Barrel Nut	✓
2	2	60624-01	Barrel Nut	✓

AERO Design Ltd.
2013 - 39th Ave. NE
Calgary, AB, T2E 6R7

AUTHORIZED RELEASE CERTIFICATE

TRANSPORT CANADA
TCCA 24-0078
AMF # 73-04

Product: FORWARD FITTING Part #: 60621-01

Approval #: SH00-48 Serial #: _____

WO #: 2006-07 Quantity: 2

Eligibility: BELL 407 Work Status: Manufactured

Remarks: _____

I hereby certify that the product identified above has been manufactured in accordance with the applicable design data and the Canadian Aviation Regulations or applicable foreign regulations.

27 JULY 06
Date

S. FATEH
Inspector's Signature

AERO Design Ltd.
2013 - 39th Ave. NE
Calgary, AB, T2E 6R7

AUTHORIZED RELEASE CERTIFICATE

TRANSPORT CANADA
TCCA 24-0078
AMF # 73-04

Product: BLOCK Part #: 60620-01

Approval #: SH00-48 Serial #: _____

WO #: 2006-07 Quantity: 2

Eligibility: BELL 407 Work Status: Manufactured

Remarks: _____

I hereby certify that the product identified above has been manufactured in accordance with the applicable design data and the Canadian Aviation Regulations or applicable foreign regulations.

27 JULY 06
Date

S. FATEH
Inspector's Signature

AERO Design Ltd.
2013 - 39th Ave. NE
Calgary, AB, T2E 6R7

AUTHORIZED RELEASE CERTIFICATE

TRANSPORT CANADA
TCCA 24-0078
AMF # 73-04

Product: BARREL NUT Part #: 49320-01

Approval #: SH00-48 Serial #: _____

WO #: 2006-07 Quantity: 2

Eligibility: BELL 407 / 206L Work Status: Manufactured

Remarks: _____

I hereby certify that the product identified above has been manufactured in accordance with the applicable design data and the Canadian Aviation Regulations or applicable foreign regulations.

27 JULY 06
Date

S. FATEH
Inspector's Signature

AERO Design Ltd.
2013 - 39th Ave. NE
Calgary, AB, T2E 6R7

AUTHORIZED RELEASE CERTIFICATE

TRANSPORT CANADA
TCCA 24-0078
AMF # 73-04

Product: BARREL NUT Part #: 60622-01

Approval #: SH00-48 Serial #: _____

WO #: 2006-07 Quantity: 2

Eligibility: BELL 407 Work Status: Manufactured

Remarks: _____

I hereby certify that the product identified above has been manufactured in accordance with the applicable design data and the Canadian Aviation Regulations or applicable foreign regulations.

27 JULY 06
Date

S. J. HED
Inspector's Signature

AERO Design Ltd.
2013 - 39th Ave. NE
Calgary, AB, T2E 6R7

AUTHORIZED RELEASE CERTIFICATE

TRANSPORT CANADA
TCCA 24-0078
AMF # 73-04

Product: BARREL NUT Part #: 60624-01

Approval #: SH00-48 Serial #: _____

WO #: 2006-07 Quantity: 2


Eligibility: BELL 407 Work Status: Manufactured

Remarks: _____

I hereby certify that the product identified above has been manufactured in accordance with the applicable design data and the Canadian Aviation Regulations or applicable foreign regulations.

27-JULY 06
Date

S. J. HED
Inspector's Signature

SENDER ACCOUNT NO. N° DE COMPTE DE L'EXPÉDITEUR 4367155		IMPORTANT - TÉLÉPHONE (403) 250 8027	
SENDER FROM / EXPÉDITEUR DE AERO DESIGN		MO DY/JR YR/AN 05 30 06	
STREET ADDRESS / ADRESSE EN LETRES 2013 39TH AVE N.E. #2013			
CITY / VILLE CALGARY	PROV./STATE/ETAT ALTA	POSTAL / ZIP T2E 6R7	
RECEIVER (TO) / DESTINATAIRE (A) CANAM AEROSPACE			
STREET ADDRESS / ADRESSE EN LETRES #1 19158 94 AVE			
CITY / VILLE SURREY	PROV./STATE/ETAT BC	POSTAL / ZIP V4W 4X8	
ATTN: (NAME / DEPT.) / À L'ATTENTION DE (NOM / SERVICE) KEN FRASER		IMPORTANT - TÉLÉPHONE (604) 888 7954	
DANGER / DANGERS: (Hazardous Goods) / (MARCHANDISES DANGEREUSES) NUT / BOLT			
SENDER SIGNATURE / SIGNATURE DE L'EXPÉDITEUR 		PICK UP / CUEILLETTE: N° DE CONF 0001	

SHIP MODE / MODE DE TRANSPORT			
AIR AÉRIEN <input type="checkbox"/>		GROUND ROUTIER <input checked="" type="checkbox"/>	
PKG / EMBAL		SERVICE	
1 TYPE ONLY TYPE SEULEMENT CHOOSE / CHOISIR	PUR-LETTER <input checked="" type="checkbox"/>	1 TYPE ONLY TYPE SEULEMENT	9 AM <input type="checkbox"/>
	PUR-PAK <input type="checkbox"/>		9h <input type="checkbox"/>
	OTHER / AUTRE <input type="checkbox"/>		10:30 AM <input type="checkbox"/>
			10h30 <input type="checkbox"/>
PAYMENT / PAIEMENT			
CASH COMPTANT <input type="checkbox"/>		CREDIT CARD CARTE DE CREDIT <input type="checkbox"/>	
RECEIVER OR THIRD PARTY ACCOUNT NO. / N° DE COMPTE DU DESTINATAIRE OU TIERS			
RECEIVER DESTINATAIRE <input type="checkbox"/>		3RD PARTY TIERS <input type="checkbox"/>	
SHIPMENT / DÉTAILS / EXPÉDITION			
#No. PCS 4 MAXIMUM	WEIGHT / POIDS SUB. TO CORR. SUIVANT CORR.		
1	KG 1 LB		
DECLARED VALUE / VALEUR DÉCLARÉE			
\$ N/A \$5,000 MAX. MAX 5 000 \$			

BILL OF LADING NO. -NOT NEGOTIABLE N° DE CONNAISSANCE -NON NEGOCIABLE		2241 630 7217	
			
1 888 SHIP-123		www.purolator.com	
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EXP DATE D'EXP.		S 30 C	
CHARGES FRAIS		TOTAL AMOUNT / MONTANT TOTAL	
THIRD PARTY BILLING NAME & ADDRESS / FACTURATION À UN TIERS: NOM & ADRESSE			
LIMITATION OF LIABILITY - IMPORTANT - PLEASE READ / LIMITATION DE RESPONSABILITÉ - IMPORTANT - LISEZ S.V.P.			
CARRIER MAY BE LIABLE SHALL NOT EXCEED \$200 PER POUND (OR \$4.41 PER KILOGRAM) COMPUTED ON THE TRANSPORTER, POURRAIT ÊTRE RESPONSABLE NE DOIT PAS EXCÉDER 200 \$ LA LIVRE (OU 4.41 \$ LE KILOGRAMME), CALCULÉ			
PLEASE REFER TO BILL OF LADING NUMBER FOR SHIPMENT STATUS. ENQUÊRES POUR TOUT RENSEIGNEMENT, VOULEZ NOUS COMMUNIQUER LE NUMÉRO DE CONNAISSANCE.			



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1 From Please print and press firmly. / Expéditeur Écrivez en caractères d'imprimerie. Appuyez fermement SVP.

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N° de compte FedEx de l'expéditeur

Sender's Name / Nom de l'expéditeur JEFF CLARKE Phone / Téléphone 403 250-8027

Company / Nom de la société AERO DESIGN LTD.

Address / Adresse 2013 39th AVE NE

Address / Adresse

City / Ville CALGARY Province AB Postal Code / Code postal T2E 6R7

2 Your Internal Reference Votre référence interne

First 24 characters will appear on invoice.
Les 24 premiers caractères apparaîtront sur la facture.

3 To/Destinataire

Recipient's Name / Nom du destinataire ALEX Phone / Téléphone 807 475-4510

Company / Nom de la société WISKAIR HELICOPTERS

Address / Adresse 520 ORVILLE WEIBEN CRES

Address / Adresse

City / Ville THUNDER BAY Province ON Postal Code / Code postal P7E 6M9

4 Shipment Information / Informations sur l'envoi

Total Packages / Nombre total de colis 1 Total Weight / Poids total 3.60 lb. / kg DIM / Poids VOL / cm

5a Express Package Service / Service colis express

FedEx Priority Overnight Higher rates apply. Des tarifs plus élevés s'appliquent. FedEx First Overnight FedEx 2Day

5b Express Freight Service / Service fret express

FedEx 1Day Freight Booking Number / Numéro de réservation Call 1.866.744.7493 to book shipment / Composez le 1.866.744.7493 pour réserver de l'espace pour votre envoi.

6 Packaging / Emballage

FedEx Envelope* FedEx Pak* FedEx Box FedEx Tube Other / Autre

Try online shipping at fedex.ca
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Questions? Visit our Web site at fedex.ca

or call 1.800.GoFedEx 1.800.463.3339.

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7 Special Handling / Manutention spéciale

HOLD at FedEx Location / RETENIR à la succursale FedEx SATURDAY Delivery / Livraison le SAMEDI

Does this shipment contain dangerous goods? / Cet envoi contient-il des marchandises dangereuses?

No / Non Yes / Oui Dry Ice / Dioxyde de carbone, solide

*Dangerous goods (including Dry Ice) cannot be shipped in FedEx packaging.
*Les marchandises dangereuses (y compris le dioxyde de carbone solide) ne peuvent pas être expédiées dans des emballages FedEx.

8 Payment Bill transportation charges to: / Paiement Facturer le transport à:

Sender / Expéditeur Recipient / Destinataire Third Party / Tierce partie Credit Card / Carte de crédit Cash / Cheque

9 Sign to Authorize Delivery Without a Signature / Signer pour autoriser la livraison sans signature

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

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Signature de l'expéditeur

10 Required Signature / Signature requise

Sender's signature & liability limitation / Signature de l'expéditeur et limite de responsabilité. Use of this Air Waybill constitutes your agreement to all the terms and conditions on the back of this Air Waybill and in our current Service Guide.

En utilisant cette lettre de transport aérien, vous acceptez les clauses et conditions qui figurent au verso de celle-ci ainsi que dans notre Guide des services courant, clauses qui peuvent limiter notre responsabilité à l'égard des dommages, pertes, retards, livraisons incomplètes, livraisons erronées, informations fautives ou incapacité de fournir de l'information sur votre envoi.

Sender's Signature
Signature de l'expéditeur

PART 157259
Rev. Date 5/04
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SFP

Jeff Clarke

From: ken [ken@canamaerospace.com]
Sent: Tuesday, May 30, 2006 11:48 AM
To: jeff@aerodesign.ca
Subject: RE: Parts Anodizing Issue

No problem im on it :)

Have a great day.

-----Original Message-----

From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Tuesday, May 30, 2006 10:36 AM
To: 'ken'
Subject: RE: Parts Anodizing Issue

Ken,

Attached is a sketch of what we discussed.

Jeff

-----Original Message-----

From: ken [mailto:ken@canamaerospace.com]
Sent: Tuesday, May 30, 2006 10:12 AM
To: jeff@aerodesign.ca
Subject: RE: Parts Anodizing Issue

Jeff,

I checked the depth you are right on all of them they are consistently 1.125 approx.
The Aft part depth is right.

The measurement shown is 1.25 from the bottom on a 7 degree angle. Section D-D i measured 1.263 to 1.268 with a .01 tolerance(was measured on flat.) for the ecnter of the slot

Measured on 7 degree angle i measure 1.267

As per our conversation moments ago, yes the hole is not located at the 1.25 distance. The center is located at 1.325 on the y axis and 5.95 on the x axis of the part. I had our engineer check my sizes before had.

Here are the pictures.

-----Original Message-----

From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Tuesday, May 30, 2006 7:18 AM
To: 'ken'
Subject: RE: Parts Anodizing Issue

The problem with the pocket depth is on the FORWARD fittings only.

I did not mean to imply the slot was not perpendicular to the face. The problem is that it is not centred on the 3/4" hole. From the bottom edge of the fitting to the centre of the hole should be 1.924" (or 1.250" from the top, but hard to measure). I checked all parts for this dimension and they were all out by 0.025" or more. The 3/4" hole is in the correct position.

The one in the picture measured 1.700" from the bottom edge of the fitting to the bottom edge of the slot. Centre of the slot is $1.700 + .391/2 = 1.896$ ". $1.924 - 1.896 = 0.0285$ ", outside of tolerance.

Jeff

-----Original Message-----

From: ken [mailto:ken@canamaerospace.com]
Sent: Monday, May 29, 2006 5:22 PM
To: jeff@aerodesign.ca
Subject: RE: Parts Annodizing Issue

I just checked a few parts of the aft parts i have no such discrepancies the pocket depth measures 1.249 on a quick check, as well as the slot on the parts that i checked are perpendicular to the 7 degree face. I checked this 2 ways, first was to setup a 7 degree angle and run a dial over for flatness, the second was a quick confirmation with set of calipers butted up to both edges. I had another person confirm my findings. Are you sure, is it possible we are not on the same page and im looking at the wrong thing ?

I htink you looked at the one piece that i sent that wasn't correct. It had writing on it this was my setup piece.

Yes they didnt anodize the parts according to spec, just gave it a black color.

-----Original Message-----

From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Monday, May 29, 2006 2:46 PM
To: 'ken'
Subject: RE: Parts Annodizing Issue

Ken,

Not quite sure what the problem is with the anodizing. Did they not hard anodize it? Will call you in the morning on that.

I have inspected the parts you sent us last week. The following non-conformances were found:

1. The pocket depth on the forward fittings was 1.125. Drawing specifies 1.25. This is acceptable because the bolts will still fit.
2. The slot in the aft fittings does not line up with the 3/4" hole. There is sufficient room to install a 3/8" bolt into the barrel nut, however it is not perpendicular to the face. The problem with that is when the bolt is tightened up, it will bend and our beams will not sit flat on the fitting. The slot can be fixed by enlarging the slot upward to the correct location.

Regards,

Jeff

-----Original Message-----

From: ken [mailto:ken@canamaerospace.com]
Sent: Monday, May 29, 2006 1:16 PM
To: Aero Designs
Subject: Parts Annodizing Issue

Jeff,

We recieved the parts back from annodizing today, the issue is that they were not annodized to mill spec as was requested, the error lies with our planner/ purchaser not writing the requirements down on the PO that we issued.

The parts have all come back black in color.

•
{ I have phoned and asked if this can be corrected, which it can. The removal
(stripping) will also remove .001 in surface material.

I await your reply

Regards

Ken

Jeff Clarke

From: Jeff Clarke [jeff@aerodesign.ca]
Sent: Tuesday, May 30, 2006 10:33 AM
To: 'ken'
Subject: RE: Parts Annodizing Issue

The drawing we have and what you have are in agreement. There is no difference in the locations. We were concerned that there were reference dimensions that may have thrown things off.

As I said before the 3/4" hole location is correct.

We will call in about 10 minutes.

Jeff

-----Original Message-----

From: ken [mailto:ken@canamaerospace.com]
Sent: Tuesday, May 30, 2006 10:12 AM
To: jeff@aerodesign.ca
Subject: RE: Parts Annodizing Issue

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Measured on 7 degree angle i measure 1.267

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Here are the pictures.

-----Original Message-----

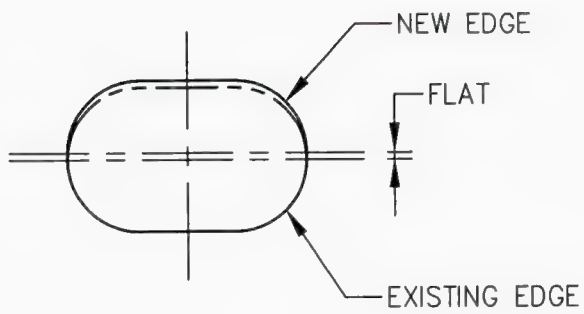
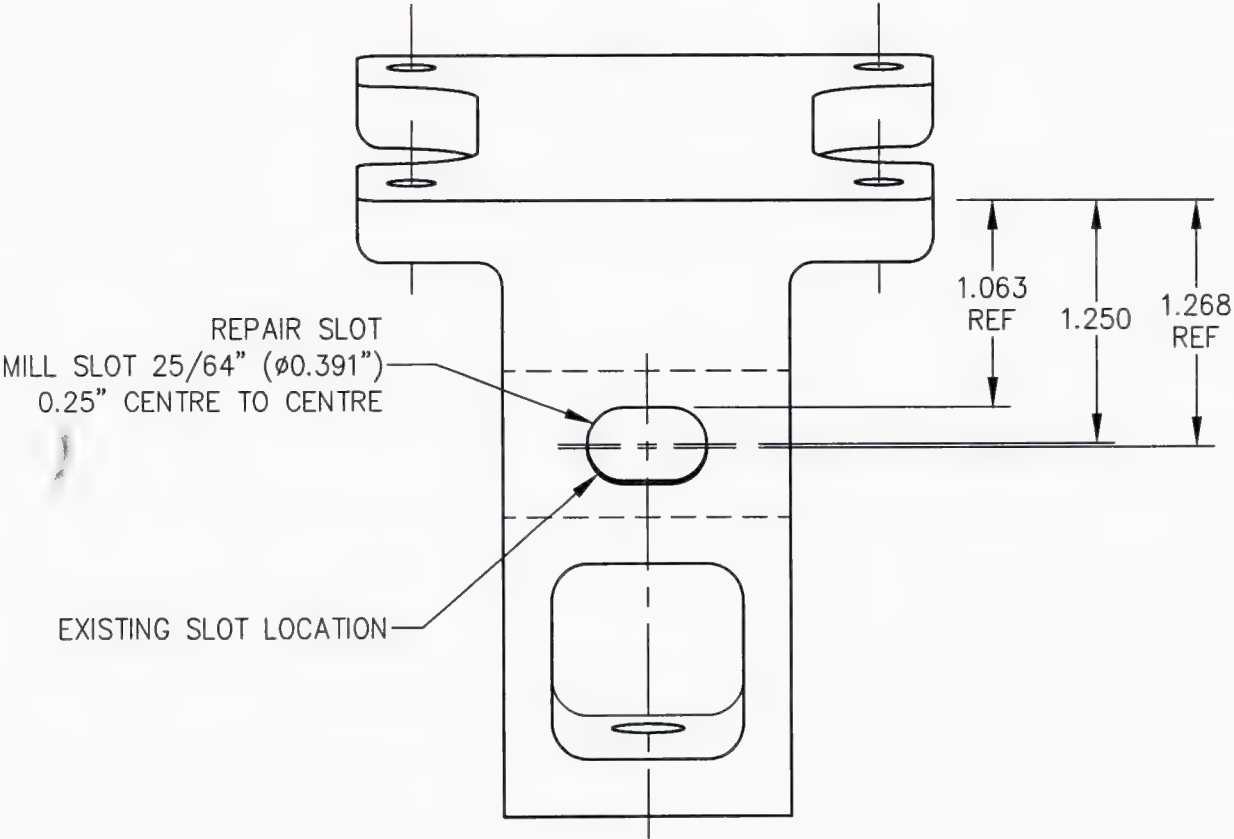
From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Tuesday, May 30, 2006 7:18 AM
To: 'ken'
Subject: RE: Parts Annodizing Issue

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The one in the picture measured 1.700" from the bottom edge of the fitting to the bottom edge of the slot. Centre of the slot is $1.700 + .391/2 = 1.896"$. $1.924 - 1.896 = 0.0285"$, outside of tolerance.

Jeff



CANAM AEROSPACE INC

Unit #1, 19158-94th Ave.
Surrey, British Columbia V4N 4X8

ORDER CONFIRMATION

Order No.: Ted B.
Date: 03/27/2006
Page: 1
Ship Date: 05/05/2006

Sold To:

Aero Design Ltd.
2013 39th Ave. NE
Calgary, Alberta T2E 6R7
Canada

Ship To:

Aero Design Ltd.
2013 39th Ave. NE
Calgary, Alberta T2E 6R7
Canada
Tel: 403-250-8027

Business No.: 887578326

Item No.	Ordered	Unit	Description	Tax	Unit Price	Amount
1	90	90	Part #49311 & 49312 Included material and CNC Terms: Net 30 BC + CC BELL 206 FWD ATT FITTING AFT 49311 FWD (X60) 49312 AFT (X30) Send 10 By Greyhound. For FR. PAY. OF EACH TYPE.		0.00	0.00
Comments						0.00
Canadian Dollars. J#2195						0.00
Total Amount						0.00

Jeff Clarke

From: ken [ken@canamaerospace.com]
Sent: Thursday, May 18, 2006 11:20 AM
To: jeff@aerodesign.ca
Subject: FW: Pocket Depth

Jeff,

The cost per part will roughly be \$5.00 each for annodizing.

Ken

-----Original Message-----

From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Wednesday, May 17, 2006 10:34 AM
To: 'ken'
Subject: Pocket Depth

Ken,

I wanted to check the depth you made the pockets on both ends of the forward fitting, and the flat end of the aft fitting. The parts we have here are 1.125" deep. The drawing specified 1.25". It is not a problem if they are 1.125", I just need to make sure the new approved drawing has the actual depth on it.

Thanks,

Jeff

5/18/2006

Jeff Clarke

From: ken [ken@canamaerospace.com]
Sent: Wednesday, May 17, 2006 12:53 PM
To: jeff@aerodesign.ca
Subject: RE: Pocket Depth

The pocket depths are to drawing size. The larger one is 1.25 the other is 1.790 approx form center of pocket. as per our phone conversation i made the slot .391 rad and not .625 as the drawing dictates

I'm still waiting on the Hard anodizing issue, the parts will be finished this afternoon and ready for a quote.

Regards

ken

-----Original Message-----

From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Wednesday, May 17, 2006 10:34 AM
To: 'ken'
Subject: Pocket Depth

Ken,

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Thanks,

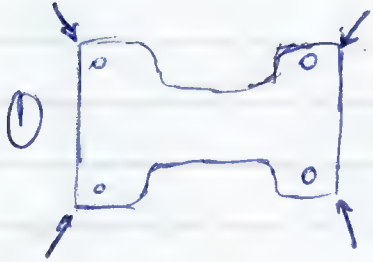
Jeff

5/18/2006

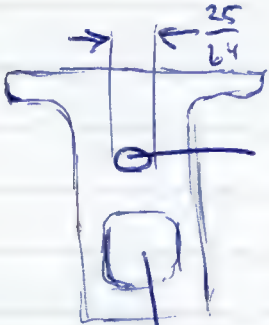
Simon o Plastic - Graphics

→ will get quote on cutting parts

May 2 meeting @
vw
2 PM
for print inspection
Tuesday.
for Mike

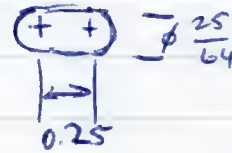


Radius on top flange corners?



$\phi 0.25 \times 25/64$ wide.

Should be



✓ Rad on bottom?



Slot too wide

Depth = 1.125 ← OK, washer will fit
Dwg = 1.25

1.25 → Should be 1.0



ϕ is slightly too small

measure 2.425

tolerance = 2.437 $\begin{matrix} +0.031 \\ -0.000 \end{matrix}$

Thickness over
0.010 under ok

Jeff Clarke

From: ken [ken@canamaerospace.com]
Sent: Friday, March 24, 2006 11:02 AM
To: jeff@aerodesign.ca
Subject: RE: Drawings

Hi Jeff,

Give me the weekend to figure out how we can make this work, the idea in making the parts was in steps, step 1 one side, step 2 the next side and on.
I there are 5 steps in total for each part. I have to prove each step, ie tooling, programming, etc.

I wanted to use the same tooling for each part for each step, cuts down on setup time. If you wanna come down to prove each step, i would have to basically make a single part of each while you are here. Figure a week.

Once your happy with the final 2 parts then start all over again with a production run. Which would be 30 parts at step 1, inspection, step 2 inspection, and so on. The inspection can be done by Alex before i continue each step, it's currently how we operate.

Then the next part of 60.

What do you figure ?

Ken

-----Original Message-----

From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Friday, March 24, 2006 8:29 AM
To: 'ken'
Subject: RE: Drawings

Ken,

We do not want to disrupt your operation to look at the samples if possible.
One option would be for me to fly out and watch the first parts as they are made, and inspect the finished product right away. Then production could continue immediately.

Our concern is that errors may have crept into the drawings on our end, or a different interpretation of the drawing, which then are repeated in the programming.

Another concern is making things simpler. The parts could be changed to accommodate different fixturing for example if it could make things easier.

Please let me know your thoughts on this.

Regards

Jeff

-----Original Message-----

From: ken [mailto:ken@canamaerospace.com]
Sent: Thursday, March 23, 2006 5:44 PM
To: jeff@aerodesign.ca
Subject: RE: Drawings

Hi Jeff,

I have an issue with setup time. If you need to see the part first then we need to change a few things. The issue is with setup and programming and available machine time.

I would consider this prototyping not a production run then. All the time and effort would be in the first two parts, ie programming and fixturing. Then to take it all down and wait for your response to a run.

The production run would only have setup, run time and materials, and change any problems that are not foreseen.

So i need to change the quote. Will need a few days

Regards

Ken

-----Original Message-----

From: Jeff Clarke [mailto:jeff@aerodesign.ca]
Sent: Thursday, March 23, 2006 1:07 PM
To: 'ken'
Subject: RE: Drawings

Ken,

Sorry for my delayed response, I was out of town for a couple of weeks.

I have attached a pdf of which radius I think you are asking about. If this is the one then, yes, it should be 1/8" (0.125 = 0.13). It should be on all 8 edges, although the sloped edges (on 49312) do not need to have a radius if it is too difficult to do.

I don't know what the problem might be with the dxf drawings. I exported it from AutoCad, but am not familiar with using the file type. Since we got your quote I guess you worked around it.

As discussed when we were out to see you, please remember that we would like to see the first of each part before proceeding with machining all 90 parts.

Jeff

-----Original Message-----

From: ken [mailto:ken@canamaerospace.com]
Sent: Tuesday, March 14, 2006 12:43 PM
To: jeff@aerodesign.ca
Subject: Drawings

On Drawing 3 49312 the radius is missing for the bottom of the part, i assume it's the same as drawing # 49311 R.130, also there is not indication that it is required on all 8 edges.

I'm sure that they are ment to be this size just confirming.

Ken

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Aero Design

From: Bruce Fraser [bruce@canamaerospace.com]
Sent: March 20, 2006 5:00 PM
To: Ted Burgoin (E-mail)
Subject: Quote # 255003 re Part # 49311 and #49312

Hello Ted; Ken gave me the prices for the above:

90 pieces as per request: Price includes material and CnC machining ----- \$ 12,775.00 Canadian dollars.

Taxes where applicable.

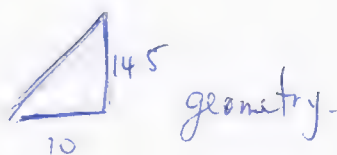
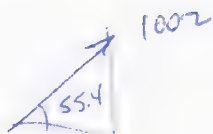
Shipping: Extra.

Delivery: 5 - 6 weeks from date of order.

Best Regards,

Bruce Fraser
Canam Aerospace Inc.
Tel: 604-888-7954
Fax: 604-888-4427
www.canamaerospace.com

TEST FOR INSERTS




Earle M. Jorgensen Company

9451 45 AVE
EDMONTON, AB T6E 6B9

Order Confirmation

DATE: 2/22/2005
CUSTOMER NUMBER: 230337
P.O. NUMBER: 5005
SALES ORDER NUMBER: 51517
FOB: Delivered
SHIP VIA: OUR TRUCK

CUSTOMER: AERO DESIGN LIMITED
2013- 39TH AVENUE NORTH EAST
CALGARY AB T2E 6R7
PHONE NO: 403-2508027

SHIP TO: AERO DESIGN LIMITED
2013- 39TH AVENUE NORTH EA
CALGARY AB T2E 6R7

ATTENTION: STEVE

ITEM #	DESCRIPTION	ORDER		UNIT PRICE	EXT. PRICE	SHIP DATE
		QTY.	UOM			
514698	2 PCs-125 LB		2 EA	\$365.0000	\$730.00	3/7/2005
	6061-T651 PLATE	QQ A	250/11			Estimated Date
	3.000 S/C 6.500" X 32.000" RECTANGLE					
	CUTTING PLATE SAW ALUM		Tolerance: +1/4 -0			
	Best Effort					
				Total:	\$730.00	
				Sales Tax:	\$51.10	
				Grand Total:	\$781.10	

For further information about your order, please contact your materials specialist:

STEVE BARACOS

E-Mail: SBARACOS@emjmetals.com Phone: (780) 4325505 Fax: (780) 4325984

Please review the above information for errors or omissions.

Conditions: All items are subject to prior sale. All items are subject to price in effect at time of shipment unless we have specifically noted otherwise. Delivery date based upon lead time at the time of quotation and is subject to change at time of order. All weights are theoretical and may be subject to adjustment.

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**Earle M. Jorgensen
Company**

9451 45 Ave NW
Edmonton, Alberta T6E 6B
9

Tel: 780.432.5505
Fax: 780.432.5984



Fax Cover Sheet

TO: STEVE	DATE: 02/22/05
COMPANY: AERO DESIGN LIMITED	TIME: 09:36:00
FAX NUMBER: 4032508333	FROM: STEVE BARACOS
SUBJECT: Quote: 51517	DEPARTMENT:
	NO. OF PAGES: 2 (including this sheet)

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Cimtech Tool & Die

Site 1 box 105 RR6 Calgary, Alberta. F: 403-568-2878 P: 403-870-3026 E-mail: Cimtech@nucleus.com

6 Jan. 03

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- Product design and Injection mould tool design.
- Injection mould building.
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- 3D c.n.c programming and machining
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- Troubleshooting (mould tools) i.e. fill times, flow, venting, cooling, gating
- Preventative maintenance of tools.
- We specialize in at troubleshooting and repair at your shop (in most cases with mould still in moulding machine), this saves down time and set-up time.
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Give us a call were only a phone call away.

Yours truly,

Dave Sangra

C.E.O.

Cimtech Tool and Die

Cimtech Tool & Die

Project Management of Plastic Injection molded parts

Site 1 Box 105 RR6 Calgary, AB, T2M 4L5.

Phone: 403-870-3026 E-mail : Cimtech@nucleus.com

Fax: 403-568-2878

21 Oct 02

To: Engineering Manager.

We at **Cimtech** will provide your company with a 24-hour support for all your tooling needs.

Complete project management for tooling and machine automation from design to manufacturing, Work with your Engineers for most efficient ergonomically designed fixturings for your company needs.

Company Description.

Cimtech Tool & die: has been established primarily to provide tooling and manufacturing expertise to entrepreneurs, Industrial designers, Plastic injections moulders and metal die casters in the central and southern Alberta area and lower main land B.C

The principal services provided are:

Project Management: for customer wishing to introduce new products into the market place.

Injection mould: manufacturing of new plastic and Die cast moulds, repair and maintenance of existing mould and dies.

Production Support: for customers with parts already tooled and in manufacture. Other secondary services associated with these are accessed and provided on an as-needed basis.

Mission Statement

To provide the highest quality product and service at the lowest over-all and cost to the customer,

Vision Statement.

To establish a network of tooling suppliers and parts manufacturers, in North America and overseas, provide high quality, short lead-time and economic products and services enabling my customers to be ready for the market before their competitors.

CIMTECH & Tool Die

Project Management of Plastic Injection molded parts

Site 1 Box 105 RR6 Calgary, AB, T2M 4L5.
Phone: 403-870-3026 E-mail : Cimtech@nucleus.com
Fax: 403-568-2878

14th June 2005

Aero Design

Jeff Clarke

Re:- machine parts

Quote # 0614-C2023

Machine: machine parts #	Unit price	Amount
Aluminium 6061		
Forward fitting 49311	\$ 130.00	\$ 2,600.00
Tooling and fixturing at cost		

Material: 6061 Alum supplied by Cimtech

The quote is based on 20 parts each type per run

40 pieces cost \$ 124.00 each

Customer to supply 3D cad files and hard copy of Drawings with tolerance and dimensional requirements marked up.

Terms: Specific delivery date to arranged at time of order, Receipt of purchases order and deposit is considered start of promised delivery time. 50% down with order, 50% at completion of order. No warranty extended to functioning of the parts produced from our moulds or Tools. All taxes extra if applicable. Shipping at cost to moulder, Quotation is valid for 10 days. 1.5% per month interest will be charged on overdue accounts

Yours truly,

Cimtech Tool & Die

CIMTECH & Tool Die

Project Management of Plastic Injection molded parts

Site 1 Box 105 RR6 Calgary, AB, T2M 4L5.
Phone: 403-870-3026 E-mail: Cimtech@nucleus.com
Fax: 403-568-2878 shop: 451-9418

23rd June 2005

Aero Design

Jeff Clarke

Re-: machine parts

Quote # 0623-C2025

Machine: machine parts #	Unit price	Amount
Aluminium 6061		
Forward mounting beam	\$ 372.5.00	\$ 7452.00
Aft mounting beam	\$ 372.5	\$ 7452.00
Tooling and fixturing at cost		

Material: 6061 Alum supplied by Cimtech

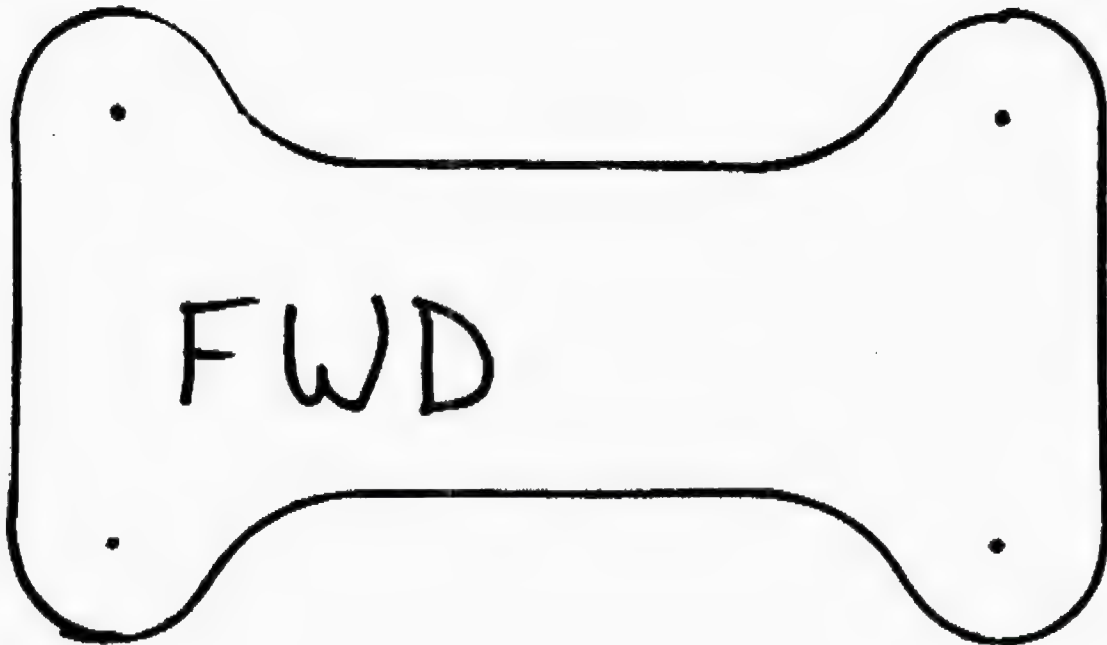
The quote is based on 20 parts each type per run

Customer to supply 3D cad files and hard copy of Drawings with tolerance and dimensional requirements marked up.

Terms: Specific delivery date to arranged at time of order, Receipt of purchases order and deposit is considered start of promised delivery time. 50% down with order, 50% at completion of order. No warranty extended to functioning of the parts produced from our moulds or Tools. All taxes extra if applicable. Shipping at cost to customer, Quotation is valid for 10 days. 1.5% per month interest will be charged on overdue accounts.

Yours truly,

Cimtech Tool & Die



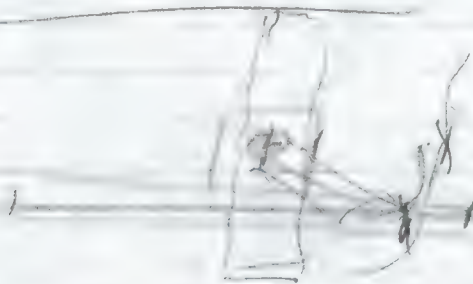
STEVE

SAME PRICE AS LAST TIME
+1000 TO FINISH

\$3000 FOR 40
\$2000 FOR 20

P.O. ISSUE WITH PRICES QUOTED

STEPHEN HUGHES CALLED TO CONFIRM MARCH 1ST



PRICE OF

SEE
WE
MEET
OF
COW

**MID WESTERN MACHINE WORKS (1987) INC.**

7715 - 46TH STREET S.E., CALGARY, ALBERTA T2C 2Y5 PHONE: (403) 279-0727 FAX: (403) 279-0729

E-mail: info@midwesternmachine.com Website: www.midwesternmachine.com

APPLICATION FOR CREDIT

LEGAL COMPANY NAME: _____

ADDRESS: _____

CITY: _____ PROVINCE: _____ POSTAL: _____

TELEPHONE: _____ FAX: _____

CORPORATION: _____ PARTNERSHIP: _____ OTHER: _____

PRINCIPAL: _____

DATE OF CORPORATION: _____

AMOUNT OF CREDIT REQUIRED: _____

ARE PURCHASE ORDERS NUMBERS REQUIRED? _____

NATURE OF BUSINESS: _____

ACCOUNTS PAYABLE CONTACT: _____

BANK: _____ BRANCH: _____

PHONE: _____ BRANCH CONTACT: _____

TRADE REFERENCES:

COMPANY NAME: ADDRESS: FAX#*S ONLY

1. _____

2. _____

3. _____

WE HERBY CERTIFY THAT ALL THE ABOVE INFORMATION IS TRUE AND
CORRECT. WE FULLY UNDERSTAND YOUR CREDIT TERMS OF NET 30 DAYS
AND AGREE TO THE PROPER PAYMENT IN CONSIDERATION OF EXTENDED
CREDIT.

SIGNED_____
DATE_____
POSITION

6061-T651 3" PLATE

INTEGRIS - NO

EMJ - MESSAGE → STEVE (780) 432-5505
METALSUPERMARKET
5" x 19" → \$350 ✓
8" x 20" → \$715, MTR ✓, MAR 4TH
16" x 32" → 4.65\$/LB

HORTON

FACING $\frac{1}{8}$ " / SIDE x 2 SIDES + 6.175" = 6.425"

CUT EACH PIECE 6.5" WIDE x 2 STRIPS = 13.0"

2 PCS @ 6.5 x 32" \$365 EA

P.O. 5005

MARCH 11TH

STEVEN SHOP MANAGER
- ELECT
- POST

MIDWESTERN
7715-46 STREET SE
T2C 2Y5
STEPHEN@MIDWESTERNMACHINE.COM

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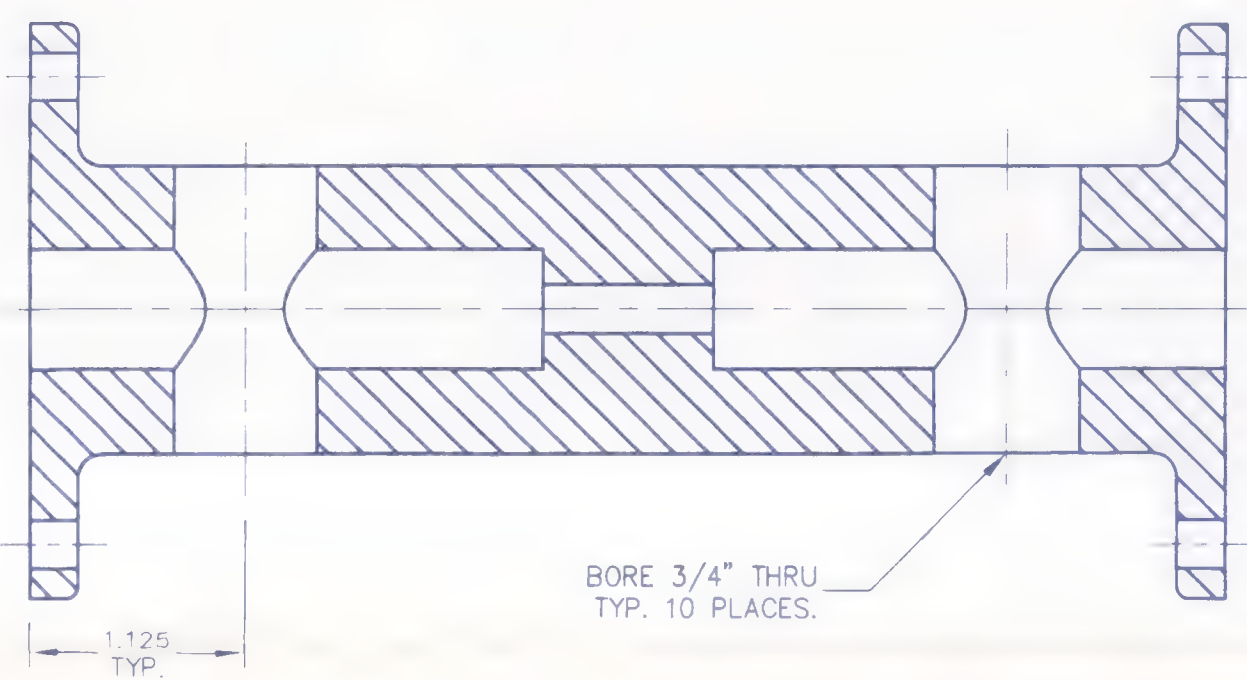
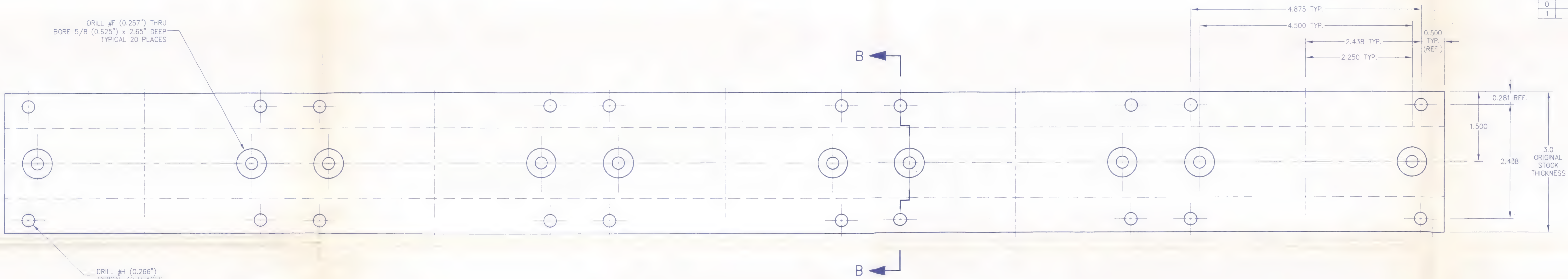
[illegible]

1	49349-01	01	AFT FITTING BLANK	5061-T651 ALUMINUM	QQ-A-250/11	3.0" PLATE												
	PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE												
QTY:				LIST OF MATERIALS														
<table border="1"> <tr> <td colspan="2">APPROVALS</td> <td>DATE</td> </tr> <tr> <td>DRAWN:</td> <td>S. FAHEY</td> <td>JUL 29/02</td> </tr> <tr> <td>CHECKED:</td> <td>E. BURGON</td> <td>JUL 29/02</td> </tr> <tr> <td>STRESS:</td> <td></td> <td></td> </tr> </table>				APPROVALS		DATE	DRAWN:	S. FAHEY	JUL 29/02	CHECKED:	E. BURGON	JUL 29/02	STRESS:			<p>AERO DESIGN LTD.</p> <p>ENGINEERING CONSULTANTS 1045 McTAVISH ROAD N.E. CALGARY, ALBERTA T2E 7G9</p>		
APPROVALS		DATE																
DRAWN:	S. FAHEY	JUL 29/02																
CHECKED:	E. BURGON	JUL 29/02																
STRESS:																		
<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES, TOLERANCES ON:</p> <table border="1"> <tr> <td>DECIMALS</td> <td>ANGLES</td> </tr> <tr> <td>X.XXX ±0.010</td> <td>±1/2"</td> </tr> <tr> <td>X.XX ±0.03</td> <td></td> </tr> <tr> <td>X.X ±0.1</td> <td></td> </tr> </table>				DECIMALS	ANGLES	X.XXX ±0.010	±1/2"	X.XX ±0.03		X.X ±0.1		<p>BELL 206L</p> <p>EXTERNAL ATTACHMENT PROVISION</p> <p>AFT FITTING BLANK - 10 FITTINGS</p>						
DECIMALS	ANGLES																	
X.XXX ±0.010	±1/2"																	
X.XX ±0.03																		
X.X ±0.1																		
<table border="1"> <tr> <td>SCALE 1 : 1</td> <td>DWG. SIZE</td> <td>DWG. NO.</td> <td>REV.</td> </tr> <tr> <td>SHEET 1 OF 1</td> <td>A0</td> <td>49347</td> <td>1</td> </tr> </table>				SCALE 1 : 1	DWG. SIZE	DWG. NO.	REV.	SHEET 1 OF 1	A0	49347	1							
SCALE 1 : 1	DWG. SIZE	DWG. NO.	REV.															
SHEET 1 OF 1	A0	49347	1															

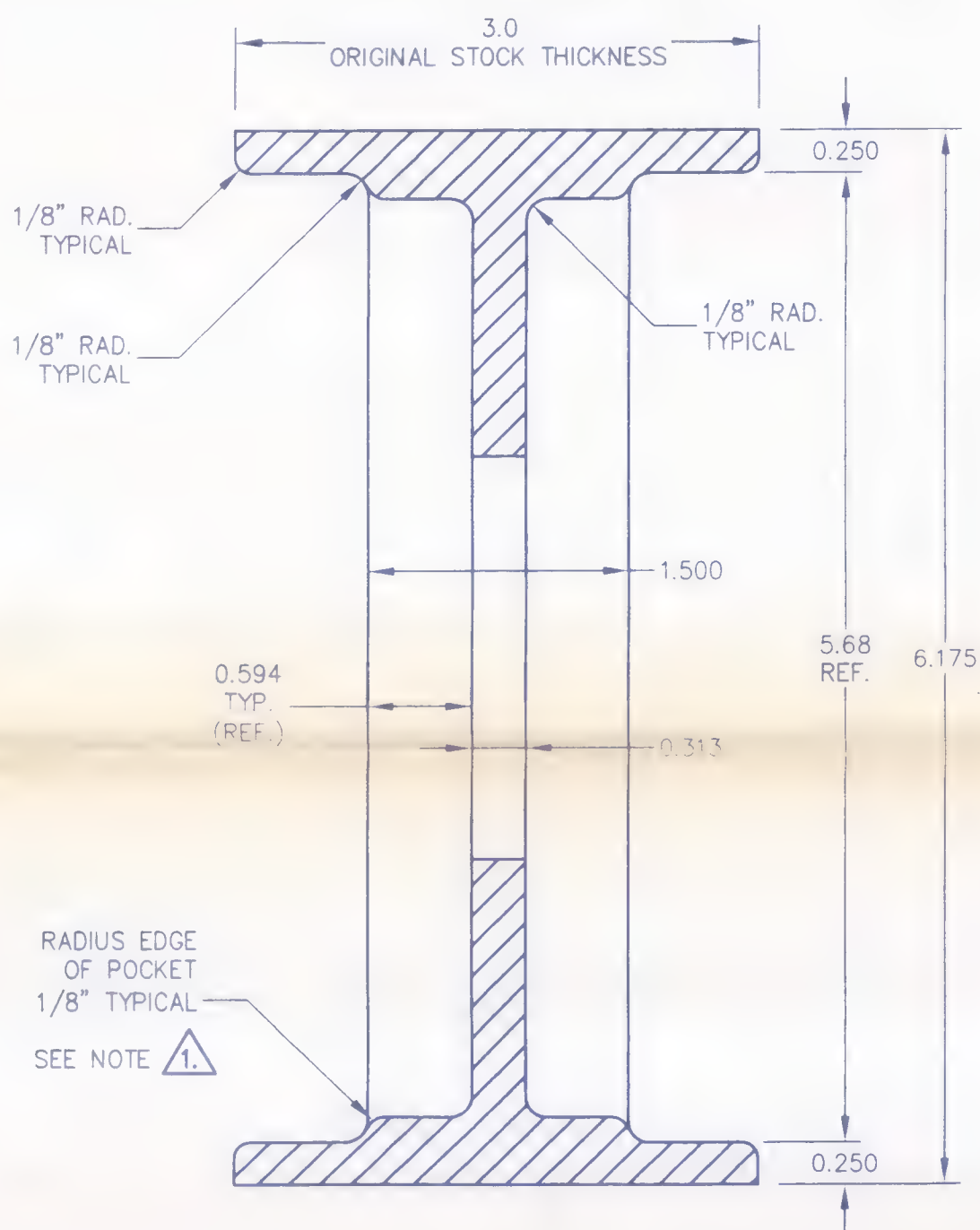
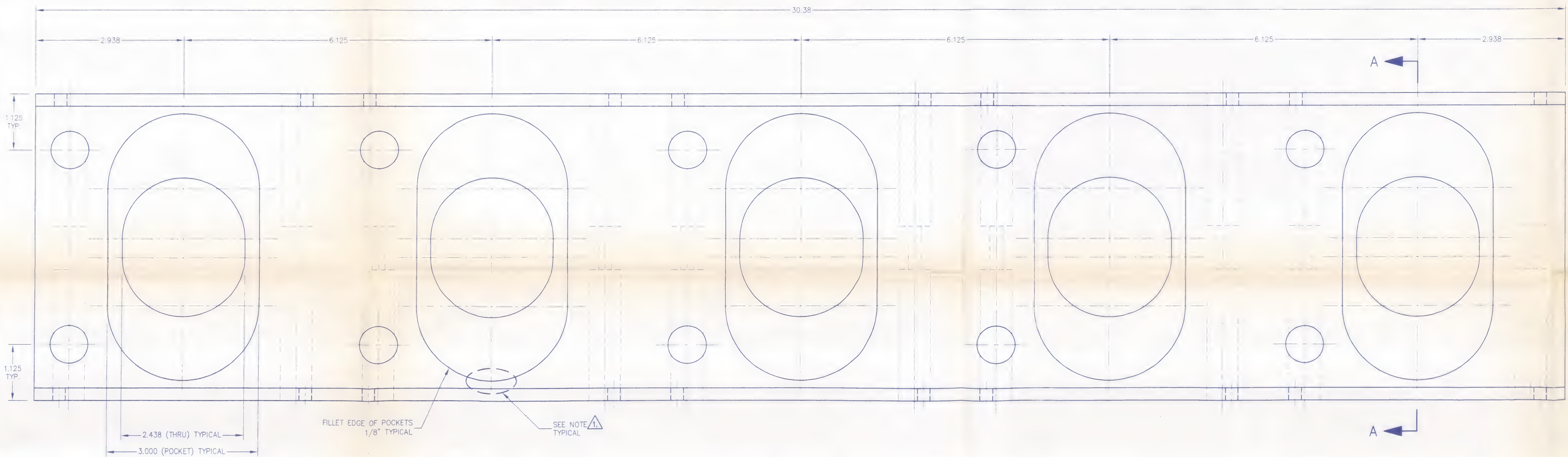


ADDED 0.250" TO FWD END OF FITTINGS

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REV.	DESCRIPTION OF CHANGE	INITIALS	DATE
0	INITIAL ISSUE	STF	JUL 29/02
1	CLARIFIED DIMENSIONS	STF	FEB 22/05



SECTION B-B



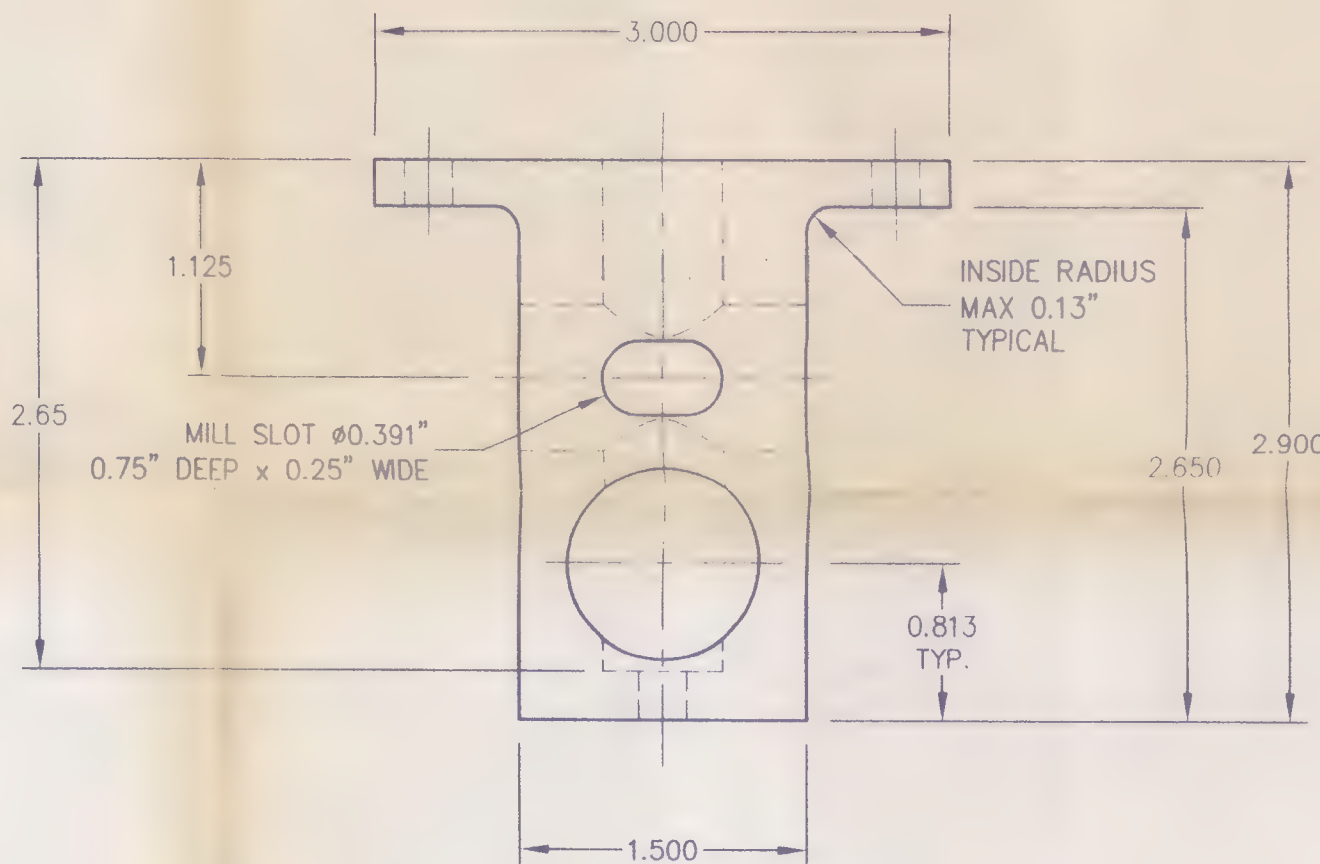
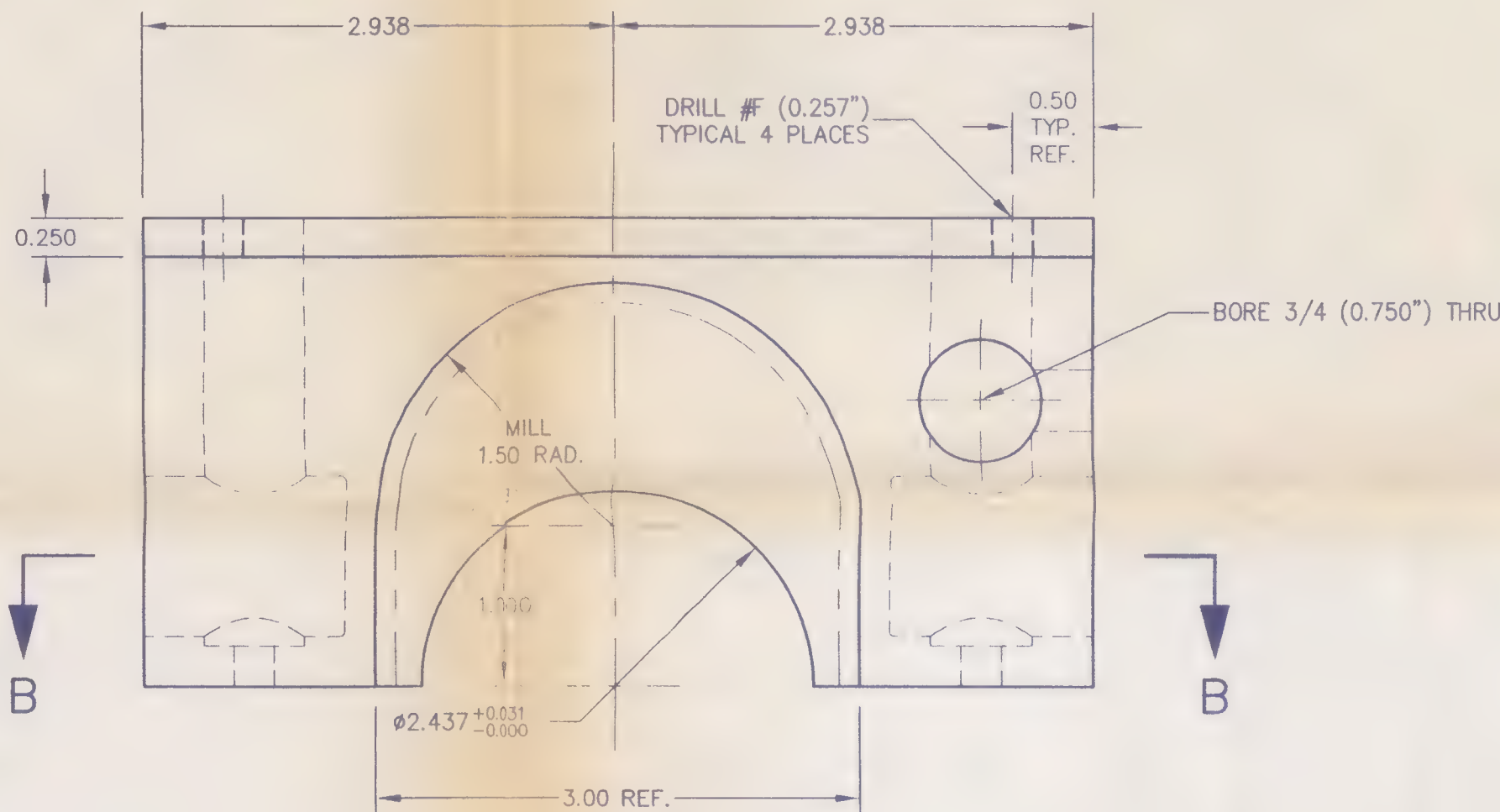
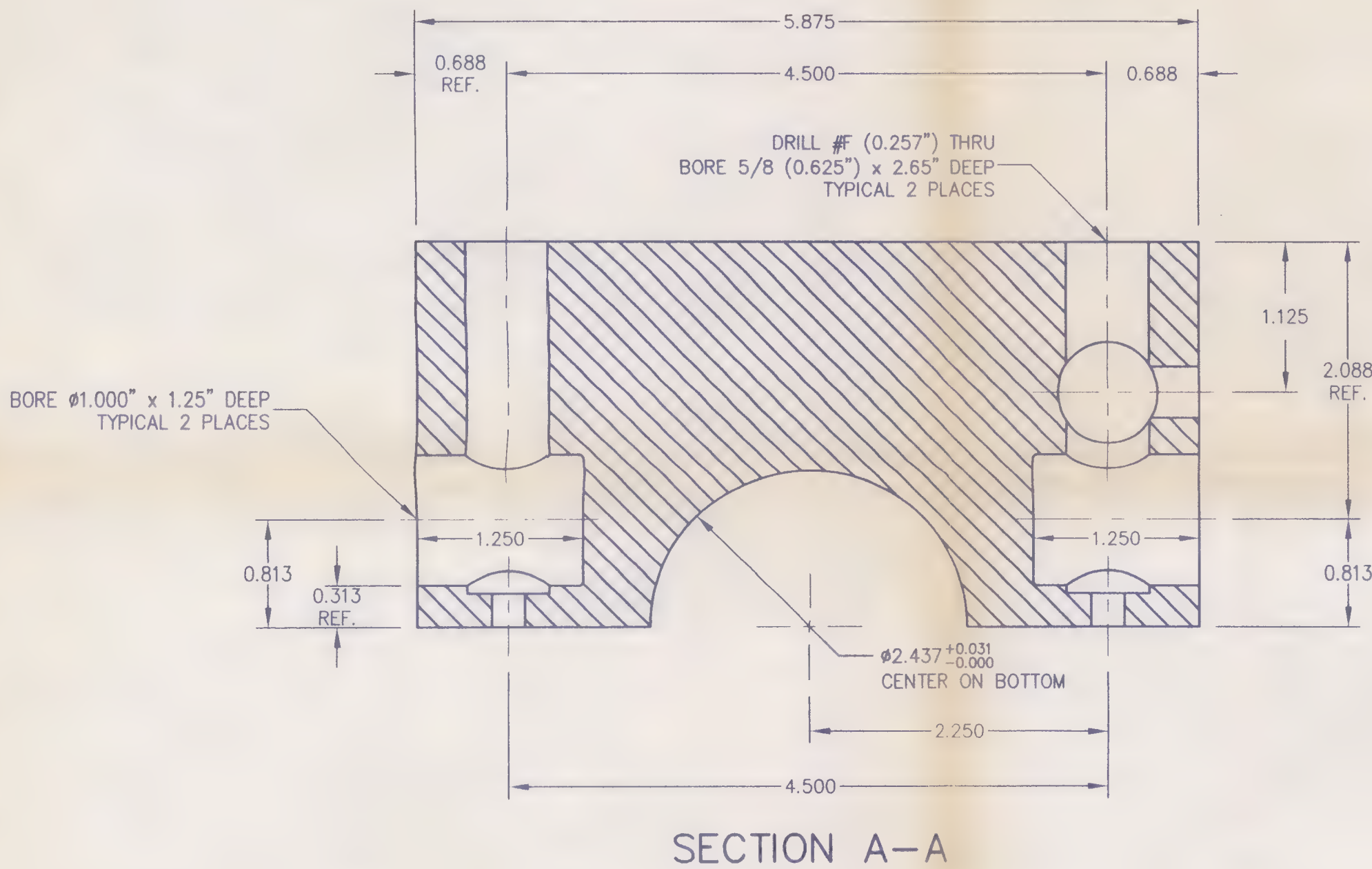
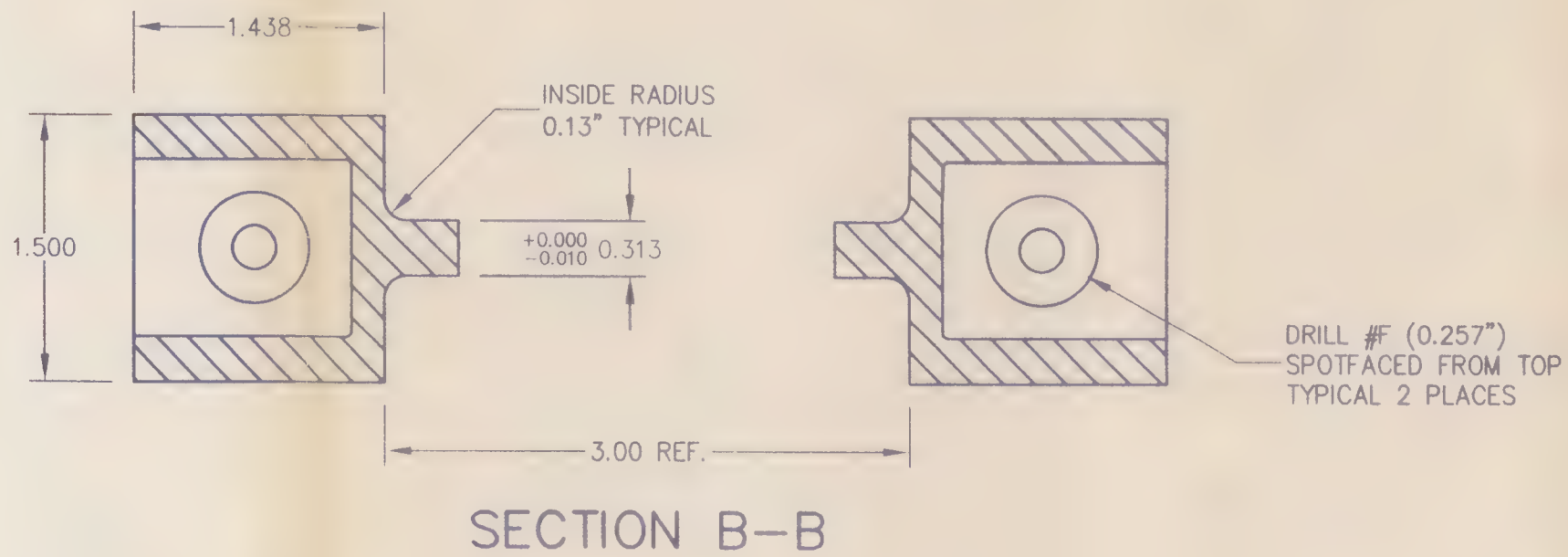
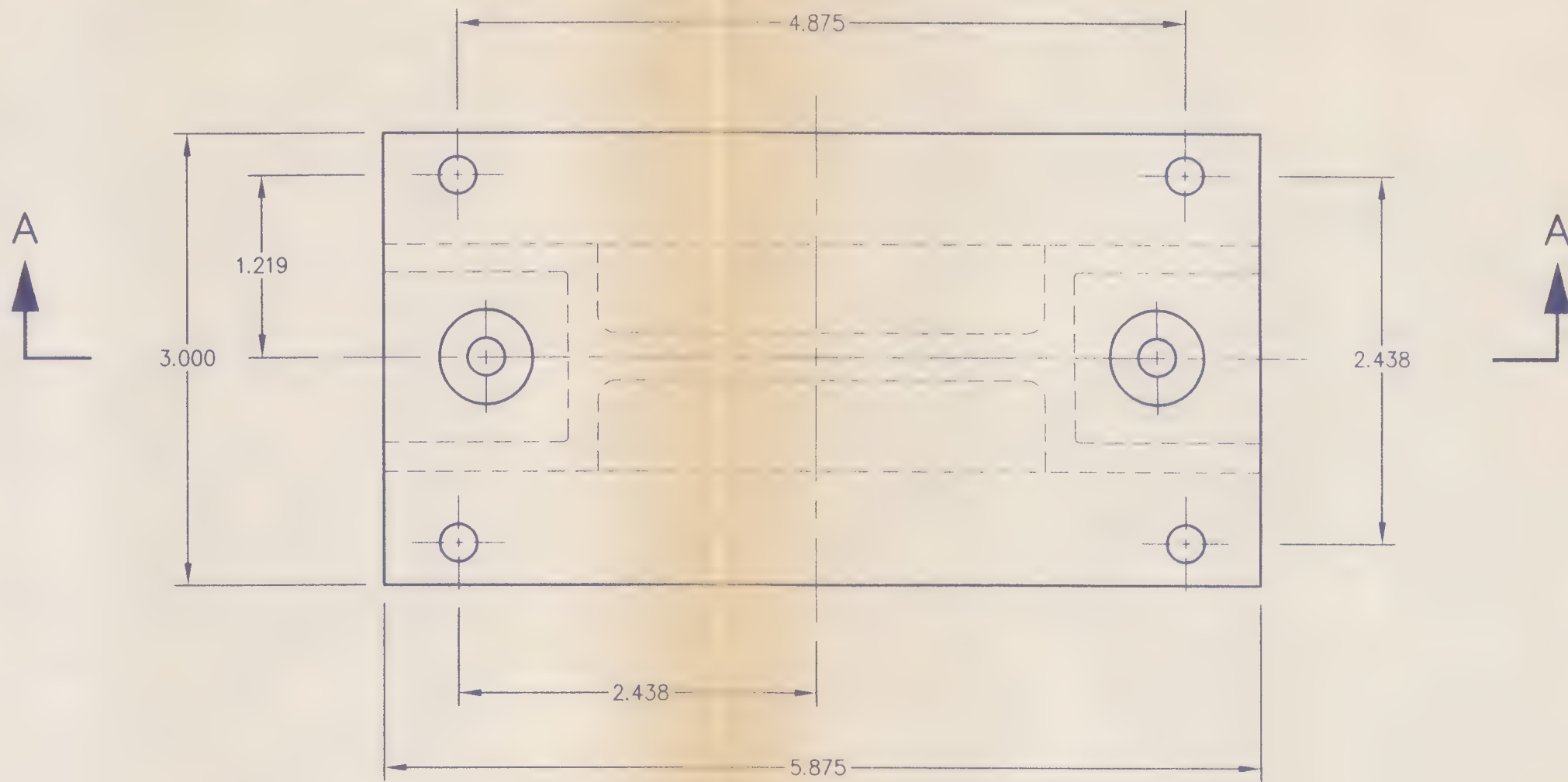
SECTION A-A

01 FORWARD FITTING BLANK

- NOTES:
- STOP RADIUS OF POCKET PRIOR TO CONTACT WITH FLANGES.
 - REMOVE ALL BURRS AND BREAK SHARP EDGES.

10	49346-01	01	FORWARD FITTING BLANK	6061-T651 ALUMINUM	QQ-A-250/11	3.0" PLATE
QTY.	PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
LIST OF MATERIALS						
APPROVALS			DATE	AERO DESIGN LTD. CONSULTING ENGINEERS, TRANSPORT CANADA APPROVALS, DAR 290M 2013 - 39TH AVENUE N.E., CALGARY, ALBERTA, CANADA, T2E 6R7 tel: (403) 250-8027 fax: (403) 250-8333 aerodesign@telusplanet.net		
DRAWN: STEVEN FAHEY		JUL 29/02				
CHECKED: E. BURGON		JUL 29/02				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON:			BELL HELICOPTER EXTERNAL ATTACHMENT PROVISION FORWARD FITTING BLANK - 10 FITTINGS			
DECIMALS: X.XXX ±0.010		ANGLES: ±1/2"				
X.XX ±0.03						
X.X ±0.1						
SCALE 1 : 1			DWG. SIZE	DWG. NO.	REV.	
SHEET 1 OF 1			49346		1	

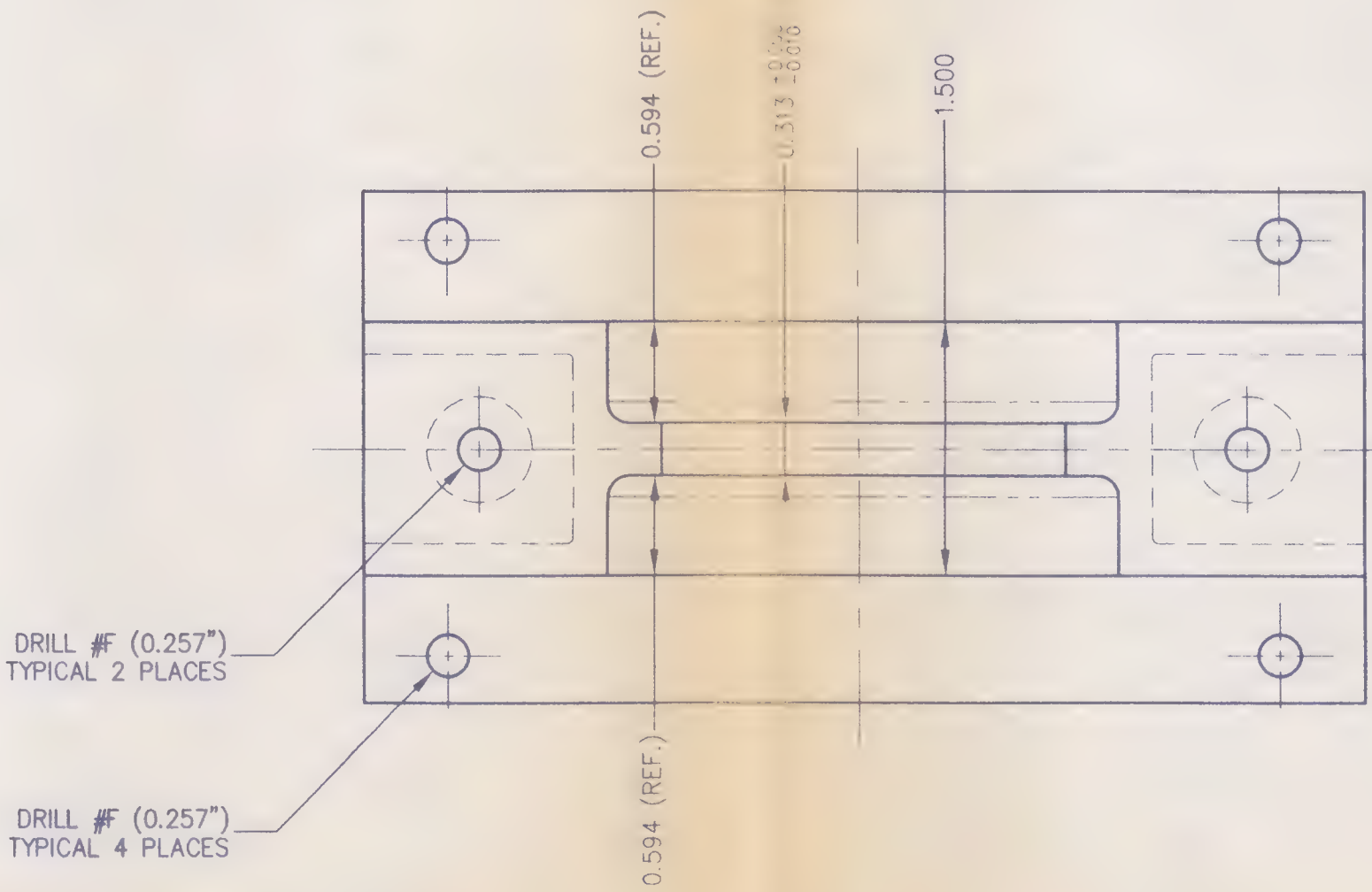
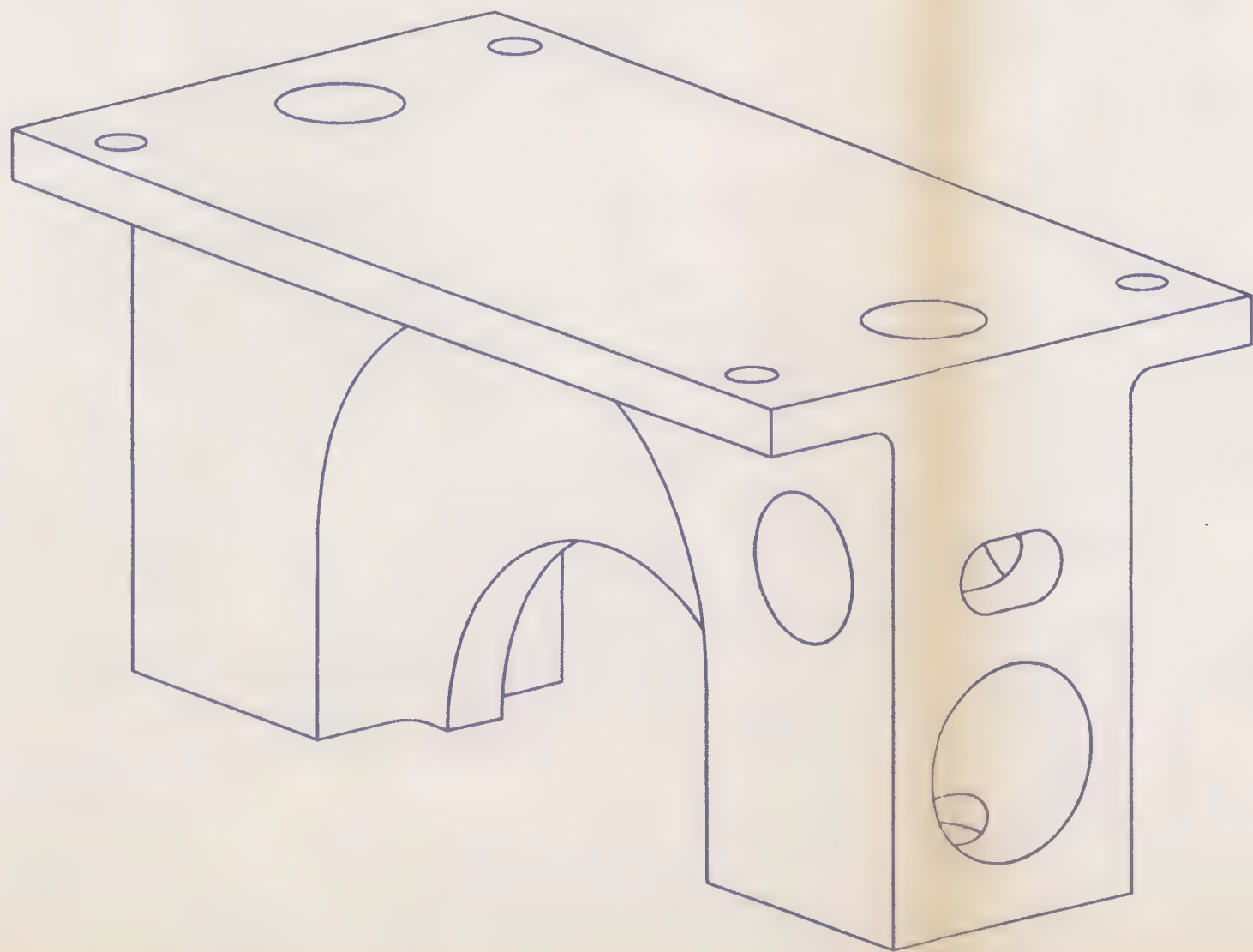
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REV.	DESCRIPTION OF CHANGE	INITIALS	DATE
1	MANUFACTURING CHANGE: SIDE MOUNTED BARREL-NUT, BEARING DIAMETER INCREASED, FLANGE REDUCED FROM 0.40" TO 0.25" PER ER493.03	STF	JUN 17/02
2	ADDED REFERENCE DIMENSIONS	STF	MAY 03/04



01 FORWARD FITTING

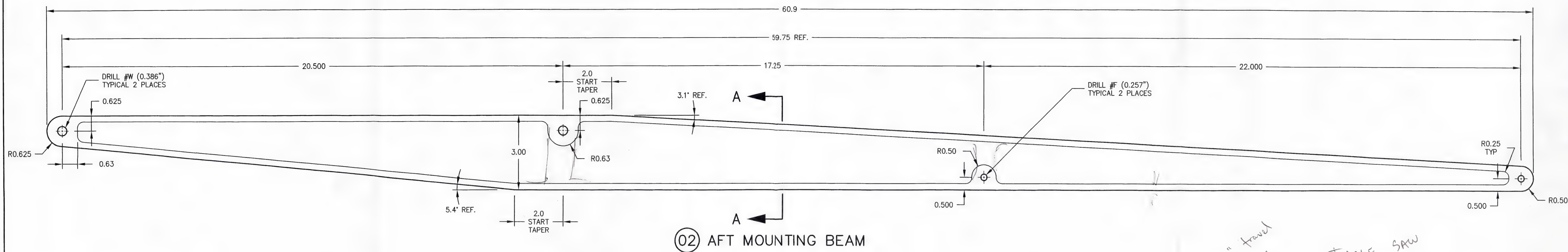
- NOTES:
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
 2. THOROUGHLY CLEAN, EPOXY PRIME, AND PAINT PART PRIOR TO ASSEMBLY.

2	49311-01	01	FORWARD FITTING	6061-T651 ALUMINUM	QQ-A-250/11	3.0" PLATE
	PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
QTY.	LIST OF MATERIALS					
APPROVALS			DATE			
DRAWN: STEVEN FAHEY			APR 24/02			
CHECKED: E. BURGOIN			APR 24/02			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON:			AERO DESIGN LTD. CONSULTING ENGINEERS, TRANSPORT CANADA APPROVALS, DAR 290M 2013 - 39TH AVENUE N.E., CALGARY, ALBERTA, CANADA, T2E 6R7 tel: (403) 250-8027 fax: (403) 250-8333 aerodesign@telusplanet.net			
DECIMALS			BELL 206L SERIES EXTERNAL ATTACHMENT PROVISIONS FORWARD FITTING			
ANGLES						
X.XXX ±0.010			±1/2°			
X.XX ±0.03						
X.X ±0.1						
SCALE 1 : 1		DWG. SIZE	DWG. NO.		REV.	
SHEET 1 OF 1		A1	49311		2	

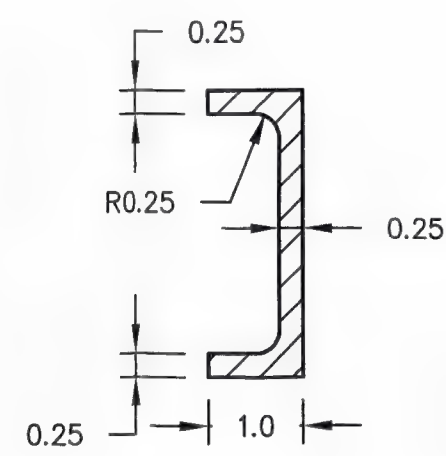
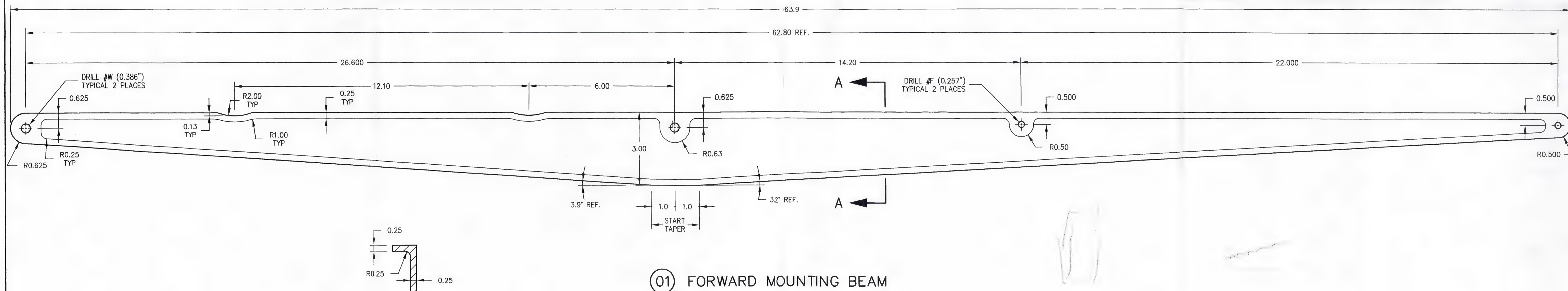


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REV.	DESCRIPTION OF CHANGE	INITIALS	DATE
1	ADDED CUTOUTS TO FORWARD BEAM	BJC	3 MAY 2004
2	ADDED 0.25" HOLE 12.700" FROM END HOLE	BJC	14 OCT 2004
3	BEAMS TO BE MILLED OUT TO CHANNEL SECTION FOR WEIGHT REDUCTION	BJC	30 MAY 2005



66" travel
Larger
CNC.
TABLE SAW
120 Teeth
Al. Paste



SECTION A-A
LOOKING THRU BEAM

1	49221-02	02	AFT BEAM	6061-T651 ALUMINUM BAR	QQ-A-200/8	3" x 1" BAR
1	49221-01	01	FORWARD BEAM	6061-T651 ALUMINUM BAR	QQ-A-200/8	3" x 1" BAR
	PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
QTY.	LIST OF MATERIALS					
	APPROVALS		DATE	AERO DESIGN LTD. ENGINEERING CONSULTANTS 1045 McTAVISH ROAD N.E. CALGARY, ALBERTA T2E 7G9		
	DRAWN: STEVEN FAHEY		APR 24/02			
	CHECKED: E. BURGOIN		APR 24/02			
	STRESS:					
	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON:			BELL 206L SERIES AND 407 SIDE MOUNTED CARGO BASKET FORWARD AND AFT MOUNTING BEAMS		
DECIMALS		ANGLES				
X.XXX ±0.010		±1/2"				
X.XX ±0.03						
X.X ±0.1						
SCALE 1 : 2		DWG. SIZE	DWG. NO.	REV.		
SHEET 1 OF 1		A1	49221	3		

4 holes
to V4 "

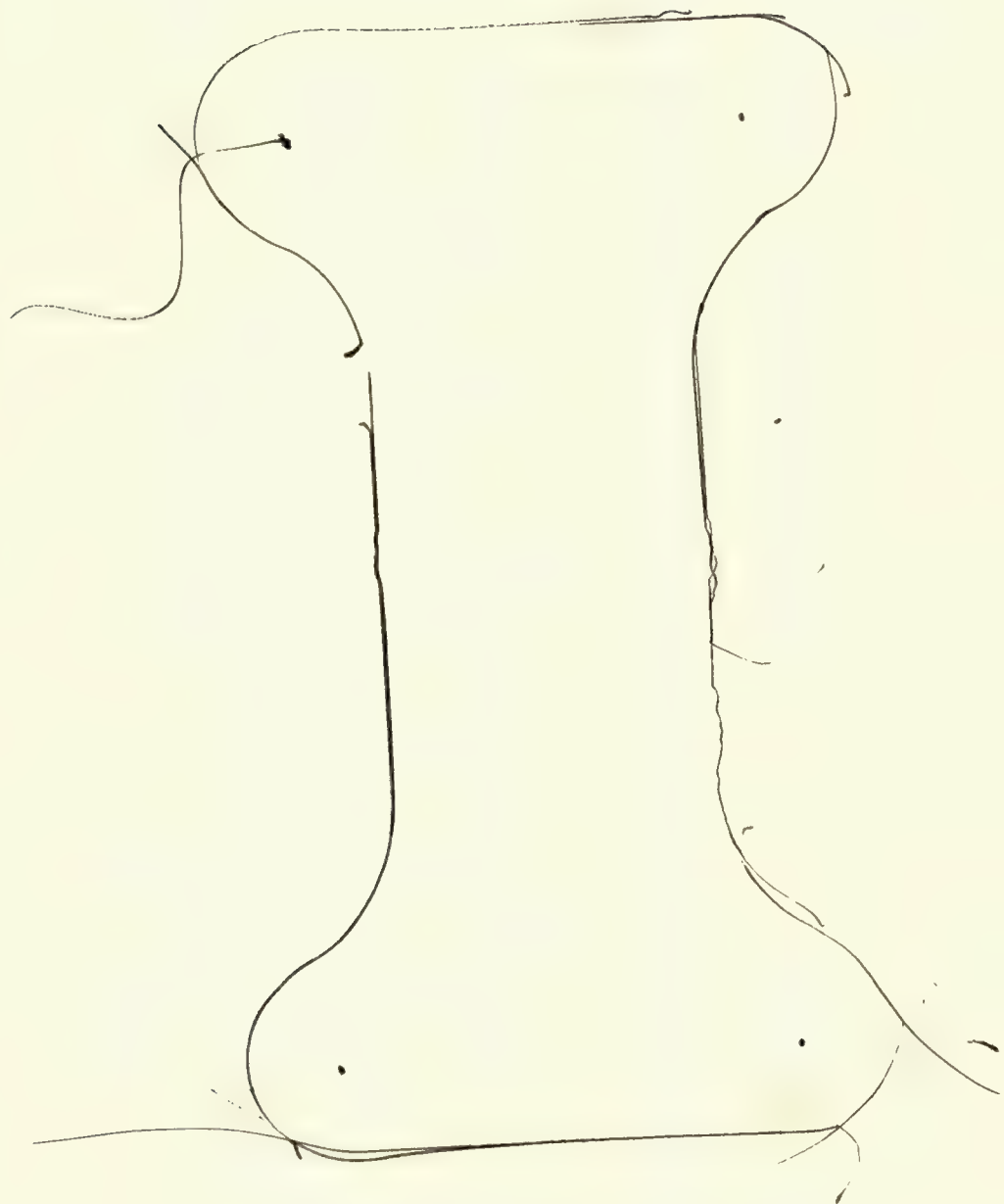


Table 3.6.2.0(b₂). Design Mechanical and Physical Properties of 6061 Aluminum Alloy Plate

Specification	AMS 4026 and AMS-QQ-A-250/11				AMS-QQ-A- 250/11		AMS 4025, AMS 4027 and AMS-QQ-A-250/11					
Form	Plate											
Temper	T451				T42 ^a		T651 and T62 ^b					
Thickness, in.	0.250-2.000		2.001-3.000		0.250- 1.000	1.001- 3.000	0.250-2.000		2.001-3.000		3.001- 4.000	4.001- 6.000 ^c
Basis	A	B	A	B	S	S	A	B	A	B	S	S
Mechanical Properties:												
F_{tu} , ksi:												
L .....	...	...	...	...	...	...	42	43	...	...	...	...
LT	30	32	30	32	30	30	42	43	42	43	42	40
F_{ty} , ksi:												
L .....	...	...	...	...	...	...	36	38	...	...	...	...
LT	16	18	16	18	14	14	35	37	35	37	35	35
F_{cy} , ksi:												
L .....	...	...	...	...	...	...	35	37	...	...	...	...
LT	16	18	...	...	...	...	36	38	...	...	...	...
F_{su} , ksi	20	21	...	...	...	...	27	28	...	...	...	...
F_{bru} , ksi:												
(e/D = 1.5)	48	52	...	...	...	...	67	69	...	...	...	...
(e/D = 2.0)	63	67	...	...	...	...	88	90	...	...	...	...
F_{bry} , ksi:												
(e/D = 1.5)	22	25	...	...	...	...	50	53	...	...	...	...
(e/D = 2.0)	26	29	...	...	...	...	58	61	...	...	...	...
e , percent:												
L	d	...	16	...	18	16	d	...	6	...	6	6
E , 10 ³ ksi	9.9											
E_c , 10 ³ ksi	10.1											
G , 10 ³ ksi	3.8											
μ	0.33											
Physical Properties:												
ω , lb/in. ³	0.098											
C , K , and α_s	See Figure 3.6.2.0											

- a Design allowables were based upon data obtained from testing samples of material, supplied in the O temper, which were heat treated to demonstrate response to heat treatment by suppliers. Properties obtained by the user may be lower than those listed if the material has been formed or otherwise cold or hot worked, particularly in the annealed temper, prior to solution heat treatment.
- b Design allowables were based upon data obtained from testing T651 plate and from testing samples of plate, supplied in the O temper, which were heat treated to demonstrate response to heat treatment by suppliers. Properties obtained may be lower than those listed if the material has been formed or otherwise cold worked, particularly in the annealed temper, prior to solution heat treatment.
- c Properties for this thickness apply only to T651 temper.
- d See Table 3.6.2.0(b₃).

AERO Design Ltd.

**ENGINEERING REPORT
ER493.03**

**BELL 206L SERIES
EXTERNAL ATTACHMENT FITTINGS
FITTING FLANGE LOAD TEST**

Revision 0

05 June, 2002

AERO Design Ltd.
Engineering Consultants
Transport Canada Approvals

1045 M^cTavish Road N.E., Calgary, Alberta T2E 7G9

Phone: (403) 250-8027

Fax: (403) 250-8333

E-Mail: aerodesign@telusplanet.net

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LOG OF REVISIONS

REV	DATE	DESCRIPTION	PAGES AFFECTED	INITIALS
0	JUN 05/02	Original Release	All	STF

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3.0 BASIS OF CERTIFICATION 5

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5.0 LOADS 6

6.0 TEST ARTICLE 6

7.0 TEST SETUP 8

8.0 TEST RESULTS..... 9

1.0 INTRODUCTION

The interchangeability of the Bell Fittings and the Aero Design Ltd. external attachment fittings is by the need for thickened upper flanges, which was shown to be necessary in Engineering Report ER493.01. The analysis in ER493.01 compared material strengths instead of using ultimate loads, and consequently showed that the upper flanges needed to be thickened by about 60%. This can be seen in the sketch below.

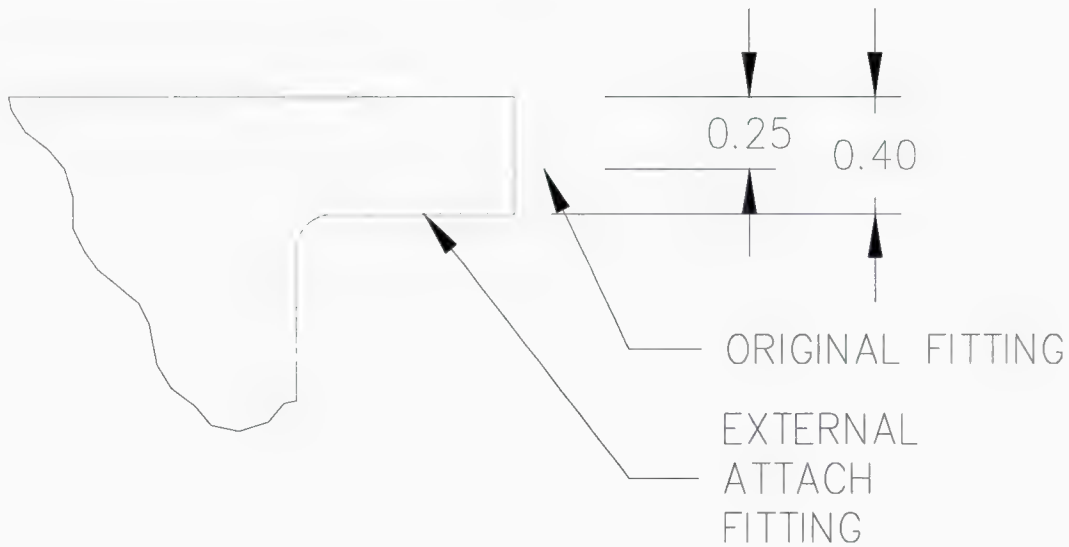


Figure 1.1 Changed Geometry of Forward Fitting Flanges (Aft Ftg Similar)

An ultimate load test has been performed that demonstrates that the original thickness of the flange is satisfactory in the Aero Design Ltd. External Attachment Provision Fittings.

2.0 REFERENCE

Aero Design Ltd. Drawings 49311 and 49312

Aero Design Ltd. Engineering Report ER493.01

3.0 BASIS OF CERTIFICATION

To be applicable to all models of the 206L series, the certification basis of the 206L-4 is used:

Bell 206L-4

Canadian Type Approval H-92

FAA Type Certificate

H2SW

FAR Part 27 dated 2 October 1964 Amendment 27-1 through 27-24 with:

27.79, 27.143, 27.173, 27.175, 27.1519, 27.1585, 27.1587 at Amdt 27-1;

27.1093, 27.1545 at Amdt 27-8;

27.45, 27.141, 27.1309 at Amdt 27-20;

27.2, 27.307, 27.337, 27.351, 27.427, 27.501, 27.571, 27.613, 27.629, 27.663, 27.674, 27.685, 27.727, 27.783, 27.807, 27.861, 27.865 at Amdt 27-28;

and 27.391, 27.395, 27.397, 27.681, 27.1357, 27.1361, replaced by 6.220, 6.225, 6.323, 6.623, 6.624, 6.625, 6.626 of CAR Part 6 dated 6 December 1956 Amendment 6-1 through 6-4.

Exceptions to FAR 27 are the deletion of: 27.71, 27.177, 27.399, 27.562, 27.610, 27.954, 27.1195, 27.1322.

Equivalent Safety Findings:

1. Skid Landing Gear (Drop Test) FAR 27.723, 27.725, and 27.727
2. Fuel Tanks (Drop Test)- FAR 27.965(c)(1) and (c)(2). FAR Part 36 dated 3 November 1969 Amendment 36-1 through 36-14, Subpart H.

4.0 APPLICABILITY OF AIRWORTHINESS DIRECTIVES

Airworthiness Directives applicable to the Bell 206L series have been reviewed and no conflicting AD's were found.

5.0 LOADS

The ultimate allowable vertical load that may be placed on the AN6 bolt in the External Attachment Provision is 3413 pounds, which is shown in Engineering Report ER493.01, Section 10.2. The report goes on to demonstrate that due to asymmetry of the connection, the ultimate vertical load applies 2113 pounds to each AN4 bolt that fastens the fitting to the fuselage (Section 12.6).

The test piece was made with a flange on each side, so that it could be bolted symmetrically. To apply 2113 pounds to each AN4 bolt, 4226 pounds tensile load must be applied to the fitting.

6.0 TEST ARTICLE

A test piece was fabricated with the same cross-sectional dimensions as the External Attachment Fittings, with the exception that the upper flange was made only 0.250" thick. The material used for the test piece is 6061-T651 aluminum plate; from the same piece, in fact, that the first set of fittings were made. The material grain orientation was also identical. Figure 6.1 shows the dimensions of the test article. It is 1.25" thick.

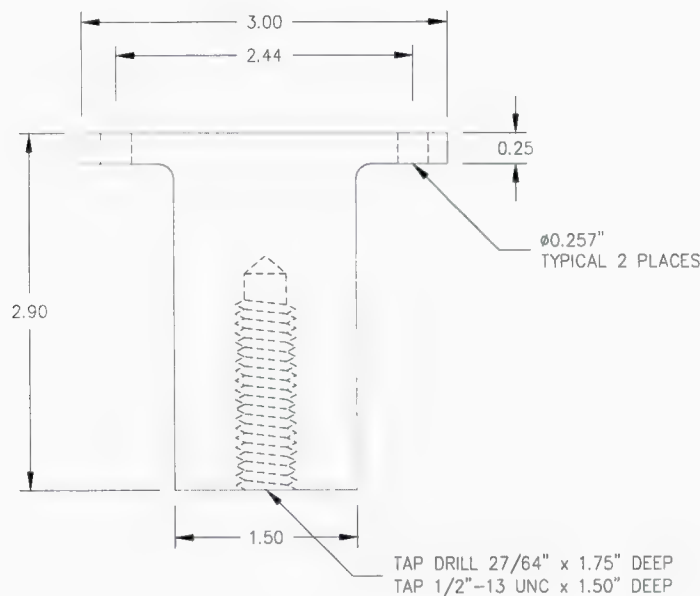


Figure 6.1 Dimensions of Test Article

The test article was bolted to a 1.0" square bar using AN4-14 bolts and MS21044N4 nuts. The bottom was blind tapped $\frac{1}{2}$ "-13 UNC and attached to a forged eye fitting with $\frac{1}{2}$ " threaded rod. This assembly is shown in Figure 6.2.



Figure 6.2 Assembly of Test Piece

7.0 TEST SETUP

The test article assembly was mounted into the press frame as shown in Figure 7.1. The load cell and come-along were hooked up in series to apply the test load. The 1" square bar beared upward on the bottom of the press table as the come-along pulled up on the fitting. Wood blocks were inserted between the 1" square bar and the press table to increase the number of cranks on the come-along (to better control the applied load).

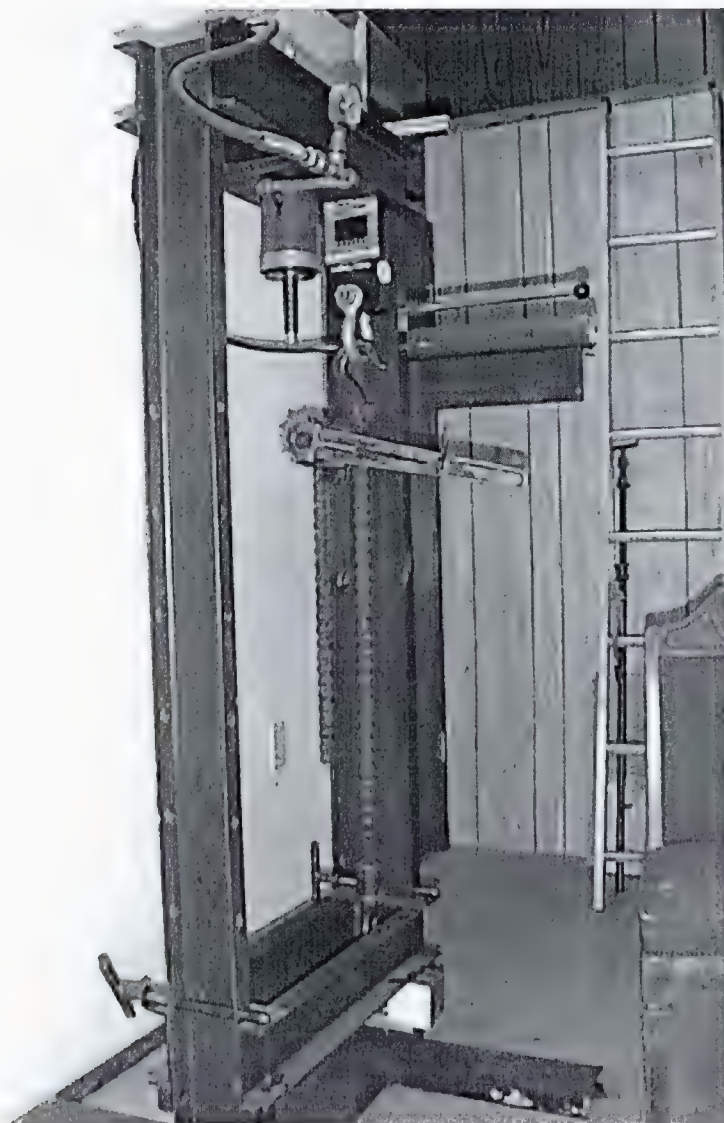


Figure 7.1 Test Apparatus

8.0 TEST RESULTS

The come-along was cranked until it applied 4460 pounds tensile load to the fitting, as shown in Figure 8.1.

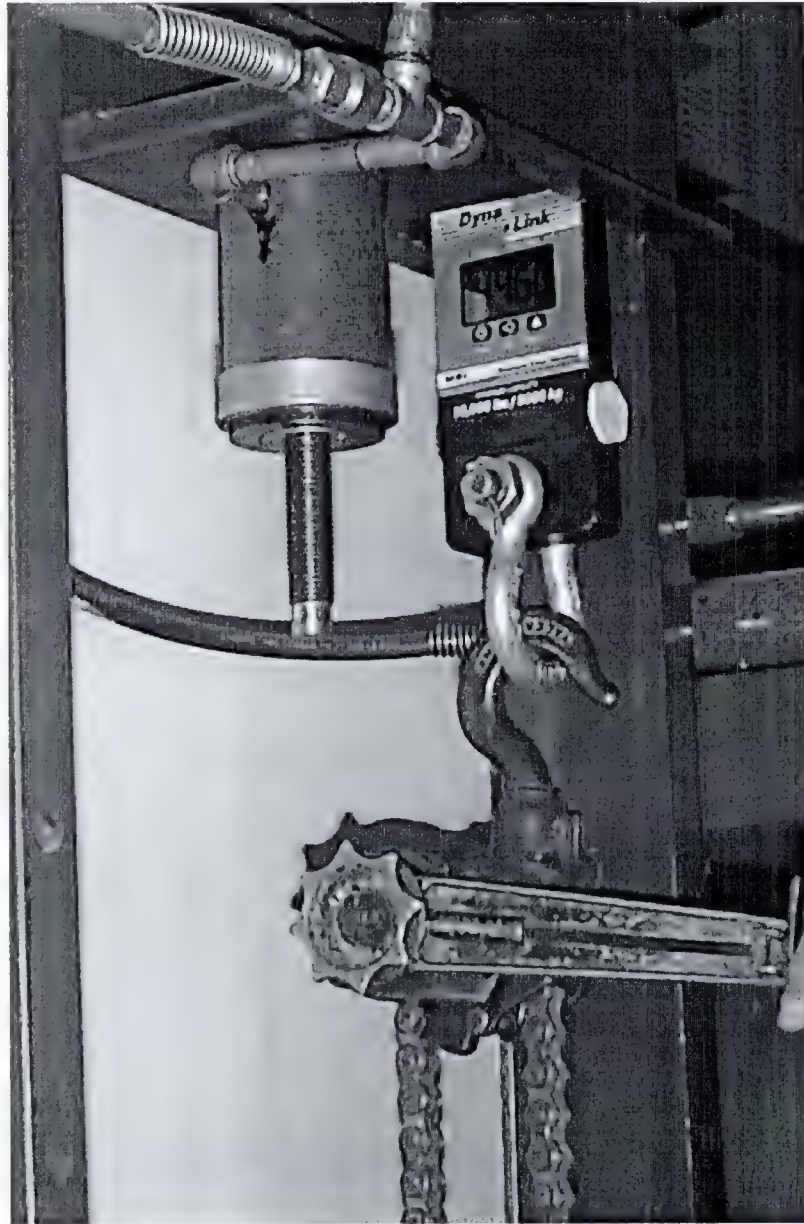


Figure 8.1 4460 Pounds Applied to fitting.

When the fitting assembly was removed from the frame, it was examined for signs of deformation or failure. No signs of either were evident, as can be seen in Figure 8.2.

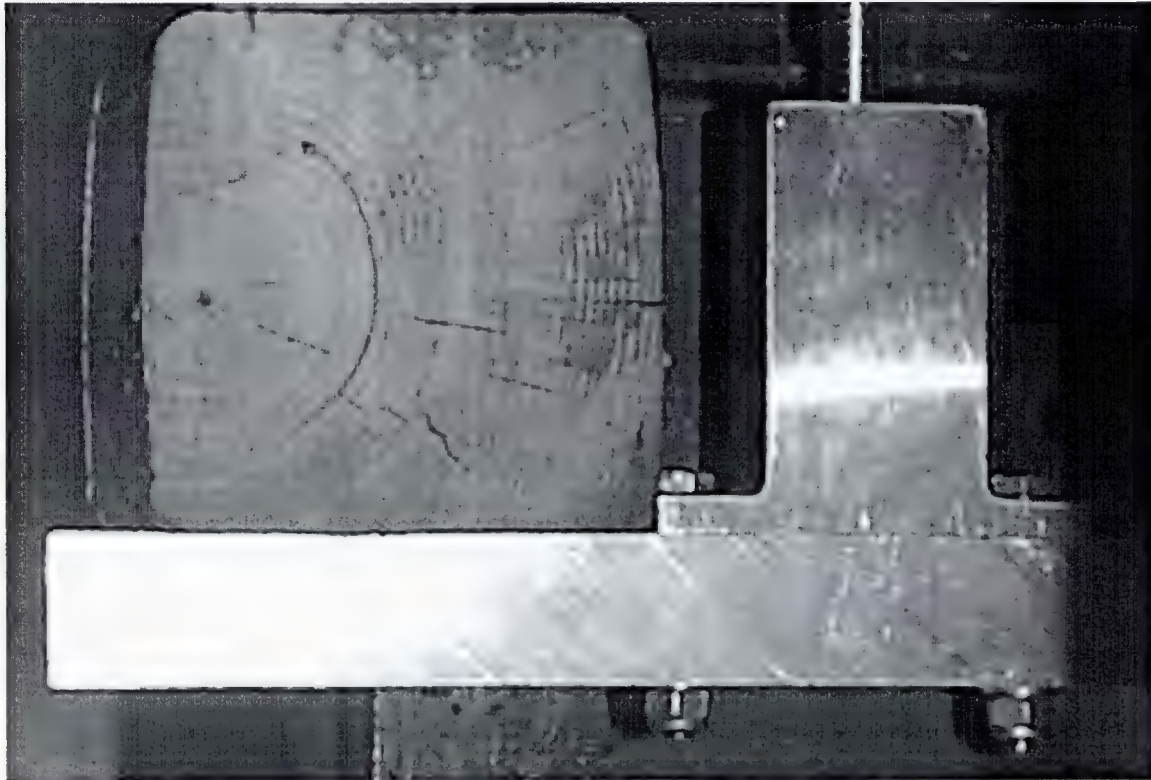


Figure 8.2 No Deflection of Flanges Under 4460 Pounds Load

This test demonstrates that under a vertical load of 4460 pounds, each flange can withstand 2230 pounds without damage or permanent deformation, when they are 0.250" thick. Only 2113 pounds will be applied to the flanges under the ultimate vertical load condition on the fitting.

Drawings 49311 and 49312 have been revised in order to reduce the thickness of the upper flange to that of the original Bell parts.

Margin of Safety = Positive

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SENDER FROM / EXPÉDITEUR ACCO DESIGN LTD.		MO. DYJR YR/AN 09/27/16	
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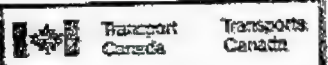
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SHIP MODE / MODE DE TRANSPORT		
AIR / AÉRIEN <input checked="" type="checkbox"/>	GROUND / ROUTE <input type="checkbox"/>	
PKG / EMBAL		
PURP. LETTER <input type="checkbox"/>	9 AM <input type="checkbox"/>	
PURP. PAK <input checked="" type="checkbox"/>	10:30 AM <input type="checkbox"/>	
OTHER / AUTRE <input type="checkbox"/>	11:30 AM <input type="checkbox"/>	
PAYMENT / PAIEMENT		
CASH / CASH <input type="checkbox"/>	CREDIT / CREDIT <input type="checkbox"/>	
3rd PARTY / TIERCE <input type="checkbox"/>		
THIRD PARTY ACCT NO. / N° DE COMPTE DU TIERS		
SENDER / EXPÉDITEUR <input type="checkbox"/>		RECEIVER / DESTINATAIRE <input checked="" type="checkbox"/>
SHIPMENT / DÉTAILS / EXPÉDITION		
#/Nbre PCS (4 MAXIMUM) 1	WEIGHT / POIDS SUBJ. TO CORR. / SUJET À CORR.	
	KG LB 1	
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NON TYPE <input type="checkbox"/> VISA <input type="checkbox"/> MC <input type="checkbox"/> AMEX		EXP. DATE D'EXP.	
THIRD PARTY ACCT NO. / N° DE COMPTE DU TIERS		CHARGES / FRAIS	
		TOTAL AMOUNT / MONTANT TOTAL	
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LIMITATION OF LIABILITY - IMPORTANT! PLEASE READ CARRIER MAY BE LIABLE SHALL NOT EXCEED \$200 PER POUND (OR \$4.41 PER KILOGRAM) COMPUTED ON THE DECLARED VALUE / VALEUR DÉCLARÉE		LIMITATION DE RESPONSABILITÉ - IMPORTANT - LISEZ S.V.P. LE TRANSPORTEUR POURRAIT ÊTRE RESPONSABLE NE DOIT PAS EXCÉDER 2.00 \$ LA LIVRE (OU 4.41 \$ LE KILOGRAMME), CALCULÉ SUR LA VALEUR DÉCLARÉE	
P. PLEASE REFER TO BILL OF LADING NUMBER FOR SHIPMENT STATUS. INQUIRIES POUR TOUT RENSEIGNEMENT, VEUILLEZ NOUS COMMUNIQUER LE NUMÉRO DE CONNAISSANCE			

SENDER RETAIN THIS COPY / COPIE DE L'EXPÉDITEUR

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
49301	External Attachment Provisions Installation	2
FMS493.01	Flight Manual Supplement	0
ICA493.90	Instructions for Continued Airworthiness	0
FABRICATION DOCUMENTS		
49311	Forward Fitting	3
49312	Aft Fitting	4
49320	Barrel Nut	1
ENGINEERING DOCUMENTS		
ER493.01	Engineering Report	0
ER493.03	Test Report	0
261.02	Honeycomb Insert Load Test Report	0
APPROVAL:		
 AIRCRAFT CERTIFICATION DIVISION APPROVED By <i>D.S. Austin</i> Appr'l No. <u>SH00-48</u> Appr'l Date <u>00-12-08</u> Issue No. <u>5</u> Issue Date <u>06-06-09</u> YY-MM-DD		ORIGINAL DATE: 19 May, 2002 REVISION DATE: 10 May, 2006
SHEET 1 OF 1		AERO DESIGN LTD. 2013 - 39 th Avenue NE Calgary, Alberta T2E 6R7 Ph. (403) 250-8027 Fax. (403) 250-8333
DCL493		BELL 206L SERIES External Attachment Provisions: Rev. 6

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS ICA 493.90

EXTERNAL ATTACHMENT PROVISIONS

Bell 206L Series

Preface

These Instructions for Continued Airworthiness shall be included in the Bell 206L Series Maintenance Manual when the External Attachment Provisions are installed in accordance with AERO Design Ltd. Document Control List DCL493, Revision 6, or later approved revision.

The information contained herein supplements the information in the basic Maintenance Manual. For Maintenance practices and procedures not contained in these Instructions for Continued Airworthiness refer to the basic Maintenance Manual and its approved supplements.

Revision 0
Date: 4 May, 2006

AERO Design Ltd.
Engineering Consultants

2013 – 39th Avenue N.E., Calgary, Alberta T2E 6R7
Phone: (403) 250-8027
Fax: (403) 250-8333
E-Mail: aerodesign@telusplanet.net

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RECORD OF REVISIONS

Revision Number	Issue Date	Date Inserted	By
0			Original Issue

LIST OF EFFECTIVE PAGES

List of Revisions Revision 0 (Original Issue) 4 May, 2006

List of Effective Pages

<u>Title</u>	<u>Pages</u>	<u>Revision No.</u>
Cover	1	0
Revision Record/List of Effective Pages	2	0
Table of Contents	3	0
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04-00-00	6	0
05-00-00	7	0
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CHAPTER 0 – INTRODUCTION

0-1 SCOPE

The following Instructions for Continued Airworthiness (ICA) satisfy the requirements of 14 CFR 27.1529, and provide the information necessary to complete the on-going maintenance and inspections required for the Bell 206L Series embodying the External Attachment Provisions as described herein.

0-2 DEFINITIONS AND ABBREVIATIONS

ICA - Instructions for Continued Airworthiness
LH - Left Hand
RH - Right Hand

0-3 DISTRIBUTION

Copies of this ICA and amendments shall be distributed to all known purchasers of the External Attachment Provisions. Requests for a copy may be made in writing to:

AERO Design Ltd.
2013 39th Avenue N.E.
Calgary, Alberta
T2E 6R7
Fax: 403-250-8333
Email: info@aerodesign.ca

Any changes will be sent to Transport Canada. All changes will be recorded in the Record of Revisions page at the front of this document.

0-4 GENERAL DESCRIPTION

External Attachment Provisions are installed to allow the installation of various equipment, such as cargo baskets. On the Bell 206L Series, the forward and aft landing gear fittings are replaced. The new fittings and blocks incorporate a barrel nut for installing equipment.

0-5 STRUCTURAL PROVISIONS

The External Attachment Provisions are installed on the Bell 206L Series helicopter in accordance with Installation Drawing 49301. The forward and aft fittings are bolted to the lower fuselage and landing gear with the same fasteners as used for the original fittings, as shown in Figure 1.

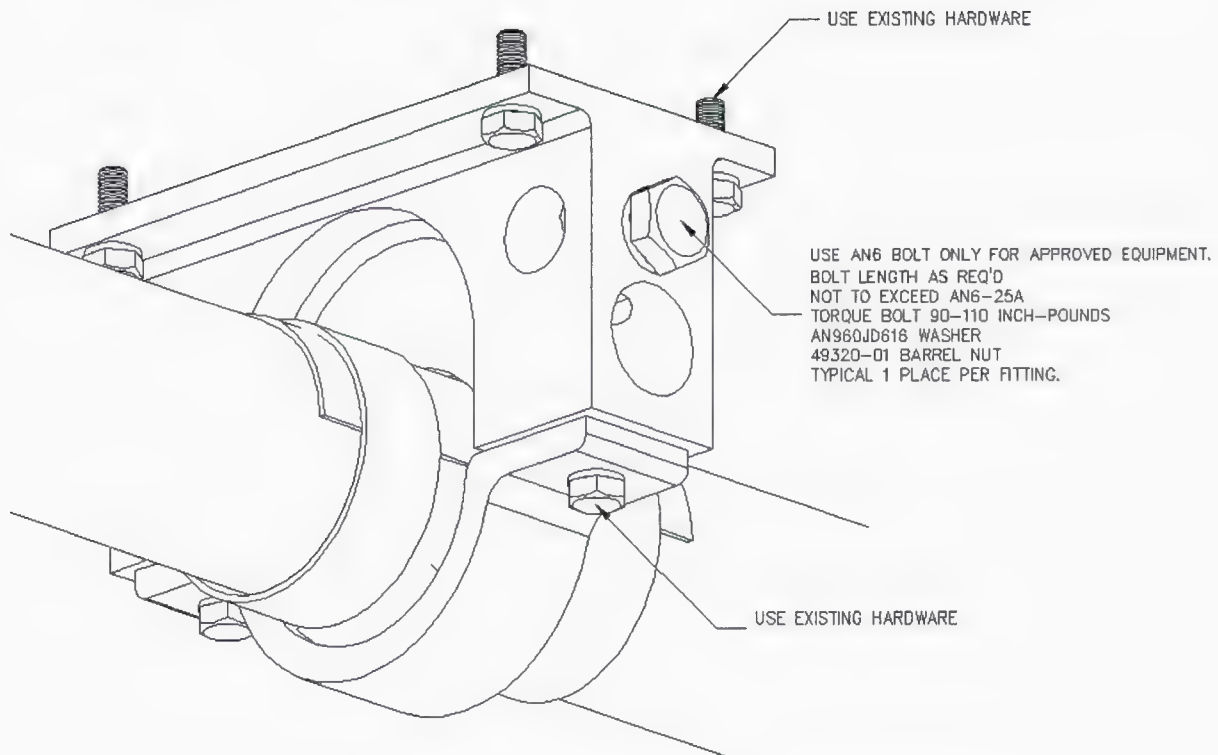


Figure 1 - Installation of External Attachment Provisions
(Forward shown, Aft similar)

CHAPTER 4 – AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is Transport Canada-approved and specifies maintenance required under Section 571 of the Canadian Aviation Regulations, unless an alternative program has been approved.

No additional airworthiness limitations have been imposed due the installation of the External Attachment Provisions.

CHAPTER 5 – INSPECTION REQUIREMENTS

5-1 INSPECTION SCHEDULE

Continued airworthiness is contingent upon compliance with the following inspection items. These items shall be completed in conjunction with the Bell 206L Series Maintenance Inspection schedule, or other approved program, or upon removal and replacement of any component of the External Attachment Provisions.

300 Hour or Annual Inspection

1. Inspection Area: Landing Gear Attachment Fittings
 - a) Visually inspect landing gear fittings in situ for cracks, corrosion or other damage.
 - b) Visually inspect hardware attaching fittings and hardware attaching cross-tubes to fitting in situ for security and damage.

Special Inspections

Following a hard landing inspect the External Attachment Provisions installation in accordance with the 300 hour or annual inspection listed above.

5-2 DAMAGE LIMITS / REPAIR INSTRUCTIONS

If damage is found in the inspections above, repair in accordance with the instructions below.

1. Landing Gear Attachment Fittings

DO NOT REPAIR DAMAGE TO FITTINGS IF BEYOND THE LIMITS BELOW.

 - a) Nicks and/or gouges on any face up to 0.030" deep and 0.125" wide may be dressed out to a smooth contour. Touch up paint as required.
 - b) Do not repair elongation of provision bolt slot (AN6 bolt). Slot is nominally 0.391" (25/64") in diameter with 1/4" maximum freedom of motion left and right.
 - c) Do not repair elongation of barrel nut hole. Hole is nominally 3/4" in diameter.

5-3 PROTECTIVE TREATMENT INFORMATION

The External Attachment Provisions are to be Alodined, primed with epoxy primer, and painted with polyurethane paint.

CHAPTER 11 – MARKINGS AND PLACARDS

The following markings are used with the External Attachment Provisions Installation in the locations noted:

- | | |
|---------------------------------------|----------|
| a) Located on top of forward fitting: | 49311-01 |
| b) Located on top of aft fitting: | 49312-01 |

CHAPTER 32 – LANDING GEAR

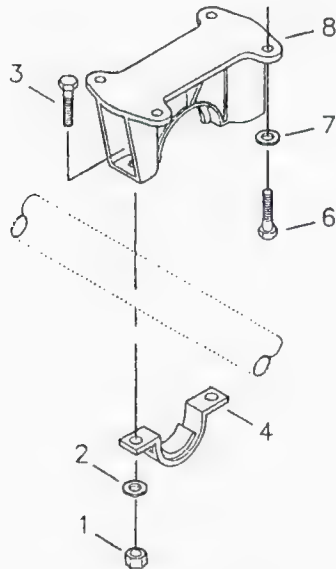
Refer to drawing 49301. Refer to Illustrated Parts Book for alternate part numbers to those that may be listed. Refer to Maintenance Manual for further information regarding installation and removal of landing gear attachments.

Raise helicopter using a jack or hoist rated at 5000 lbs or more when changing fittings. Raise helicopter until landing gear is at least 4" off the ground.

32-1 FORWARD LANDING GEAR FITTINGS INSTALLATION

Refer to Figure 4

1. Locate right hand forward Landing Gear Fitting (8) on bottom of helicopter and install with four Bolt (6) and Washer (7). Repeat for left side.
2. Raise front landing gear cross tube into position on the landing gear fittings.
3. Position Strap Assembly (4) under cross tube on landing gear fitting. Install two Bolt (3), Washer (2), and Nut (1).



Item	Part	Bell 206L
1	Nut	MS21042L4
2	Washer	MS20002C4
3	Bolt	NAS6604-10
4	Strap Assembly	206-052-105-031

6	Bolt	AN4-6A
7	Washer	NAS1149D0463J
8	Fitting (Original)	206-033-108-001
8	Fitting (New)	49311-01

Figure 4 – Forward Landing Gear Fitting

32-2 FORWARD LANDING GEAR FITTINGS REMOVAL

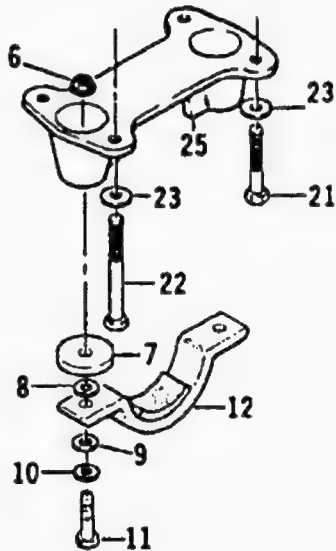
Refer to Figure 4

1. Remove any equipment installed on the External Attachment Provisions.
2. Remove two Bolt (3), Washer (2), Nut (1) from ends of Strap Assembly (4) and remove Strap Assembly from right hand forward Landing Gear Fitting (8). Repeat for left hand side.
3. Lower front landing gear cross tube to the ground.
4. Remove four Bolt (6) and Washer (7) from right hand forward Landing Gear Fitting (8) and remove fitting. Repeat for left hand side.

32-3 AFT LANDING GEAR FITTINGS INSTALLATION

Refer to Figure 5

1. Locate right hand aft Landing Gear Fitting (25) on bottom of helicopter and install with four Bolt (21, 22) and Washer (23). Repeat for left side.
2. Raise aft landing gear cross tube into position on the landing gear fittings.
3. Position Strap Assembly (12) under cross tube on landing gear fitting. Install two Bolt (11), Washers (8, 9, 10), Spacer (7), and Nut (6).



Item	Part	Bell 206L
6	Nut	MS21042L5
7	Spacer	206-053-123-001
8	Washer	AN970-5
9	Washer	NAS1149D0516J
10	Washer	MS20002C5
11	Bolt	NAS6605-11
12	Strap Assembly	206-052-105-035

21	Bolt	NAS6204-9
22	Bolt	NAS6204-25
23	Washer	NAS1149D0463J

25	Fitting (Original)	206-033-109-001
25	Fitting (New)	49312-01

Figure 5 – Aft Landing Gear Fitting

32-4 AFT LANDING GEAR FITTINGS REMOVAL

Refer to Figure 5

1. Remove any equipment installed on the External Attachment Provisions.
2. Remove two Bolt (11), Washers (8, 9, 10), Spacer (7), and Nut (6) from ends of Strap Assembly (12) and remove Strap Assembly from right hand aft Landing Gear Fitting (25). Repeat for left hand side.
3. Lower aft landing gear cross tube to the ground.
4. Remove four Bolt (21, 22) and Washer (23) from right hand aft Landing Gear Fitting (25) and remove fitting. Repeat for left hand side.

32-5 WEIGHT AND BALANCE

Part # Name		Weight (lbs)	Longitudinal		Lateral	
			Arm (in)	Moment (in-lbs)	Arm (in)	Moment (in-lbs)
49311-01	Forward Fitting (Pair)	2.68	73.0	195.6	0	0.0
49312-01	Aft Fitting (Pair)	3.44	154.74	532.3	0	0.0
Total		6.12	118.9	727.9	0	0.0

32-6 STRUCTURAL FASTENER DATA

Refer to Bell Standard Practices Manual BHT-ALL-SPM for torque values not listed in this ICA.

MSI 53 – Review of Supplemental Instructions for Continued Airworthiness

APPENDIX A-3 NORMAL CATEGORY ROTORCRAFT – CAR 527

BLOCK 1

Name of the applicant for the design change approval:	Aero Design Ltd.
Description of the design change:	Installation of External Attachment Provisions on Bell 206L Series
Certification Basis of design change and revision date:	FAR 27, Amendment 27-30
CAR Standard A527.1(c) Program showing how changes to supplemental ICA made by the applicant or by the manufacturers of products and appliances installed in the aeroplane pursuant to the design change will be distributed:	Section 0-3 of Supplemental ICA (ICA 493.90)
CAR Standard 513.05 (1) (g) (iv): Installation Instructions:	Installation Drawing 49301

BLOCK 2

Note: Enter "N/A" when no supplemental ICA are needed.

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A527.2 (a) Manual(s) (a) The Instructions for Continued Airworthiness must be in the form of a manual or manuals as appropriate for the quantity of data to be provided.	ICA ref: Bell 206L Series Maintenance Manuals, BHT-206L-MM BHT-206L1-MM BHT-206L3-MM BHT-206L4-MM	Supplemental ICA ref: Single Manual (ICA493.90)
A527.2 (b) Practical arrangement (b) The format of the manual or manuals must provide for a practical arrangement.	ICA ref: Bell 206L Series Maintenance Manual	Supplemental ICA ref: Arranged in ATA format
A527.3 The Instructions for Continued Airworthiness must contain the following manuals or sections, as appropriate, and information:		
A527.3 (a) Rotorcraft maintenance manual or section		
A527.3 (a) (1) (Introduction) (1) Introduction information that includes an explanation of the rotorcraft's features and data to the extent necessary for maintenance or preventive maintenance.	ICA ref: Bell 206L Series Maintenance Manual, Chapter 1	Supplemental ICA ref: Section 0-1

MSI 53 – Review of Supplemental Instructions for Continued Airworthiness

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A527.3 (a) (2) (Description) (2) A description of the rotorcraft and its systems and installations including its engines, rotors, and appliances.	ICA ref: Bell 206L Series Maintenance Manual, Chapter 1	Supplemental ICA ref: Section 0-5
A527.3 (a) (3) Control & Operation (3) Basic control and operation information describing how the rotorcraft components and systems are controlled and how they operate, including any special procedures and limitations that apply.	ICA ref: N/A	Supplemental ICA ref: N/A
A527.3 (a) (4) Servicing (4) Servicing information that covers details regarding servicing points, capacities of tanks, reservoirs, types of fluids to be used, pressures applicable to the various systems, location of access panels for inspection and servicing, locations of lubrication points, lubricants to be used, equipment required for servicing, tow instructions and limitations, mooring, jacking, and levelling information.	ICA ref: Bell 206L Series Maintenance Manual, Chapter 12	Supplemental ICA ref: N/A
A527.3 The Instructions for Continued Airworthiness must contain the following manuals or sections, as appropriate, and information:		
A527.3 (b) Maintenance Instructions.		
A527.3 (b) (1) Scheduling 1) Scheduling information for each part of the rotorcraft and its engines, auxiliary power units, rotors, accessories, instruments, and equipment that provides the recommended periods at which they should be cleaned, inspected, adjusted, tested, and lubricated, and the degree of inspection, the applicable wear tolerances, and work recommended at these periods. However, the applicant may refer to an accessory, instrument, or equipment manufacturer as the source of this information if the applicant shows that the item has an exceptionally high degree of complexity requiring specialized maintenance techniques, test equipment, or expertise. The recommended overhaul periods and necessary cross-references to the Airworthiness Limitations section of the manual must also be included. In addition, the applicant must include an inspection program that includes the frequency and extent of the inspections necessary to provide for the continued airworthiness of the rotorcraft.	ICA ref: Bell 206L Series Maintenance Manual, Chapter 5	Supplemental ICA ref: Section 5-1

MSI 53 – Review of Supplemental Instructions for Continued Airworthiness

Regulatory Standard Reference Column 1	Design Approval Holder (DAH) ICA Reference Column 2	Applicant Means of Compliance Supplemental ICA Requirements Column 3
A527.3 (b) (2) Troubleshooting (2) Troubleshooting information describing probable malfunctions, how to recognize those malfunctions, and the remedial action for those malfunctions.	ICA ref: N/A	Supplemental ICA ref: N/A
A527.3 (b) (3) Removal/replacement (3) Information describing the order and method of removing and replacing products and parts with any necessary precautions to be taken.	ICA ref: Bell 206L Series Maintenance Manual, Chapter 32	Supplemental ICA ref: Section 32-1 thru 32-4
A527.3 (b) (4) General (4) Other general procedural instructions including procedures for system testing during ground running, symmetry checks, weighing and determining the center of gravity, lifting and shoring, and storage limitations.	ICA ref: Bell 206L Series Maintenance Manual, Chapter 7 and 8	Supplemental ICA ref: Section 32-5
A527.3 (c) Access (c) Diagrams of structural access plates and information needed to gain access for inspections when access plates are not provided.	ICA ref: N/A	Supplemental ICA ref: N/A
A527.3 (d) Special inspections (d) Details for the application of special inspection techniques including radiographic and ultrasonic testing where such processes are specified.	ICA ref: Bell 206L Series Maintenance Manual, Chapter 5	Supplemental ICA ref: Section 5-1
A527.3 (e) Protective treatment (e) Information needed to apply protective treatments to the structure after inspection.	ICA ref: Bell Standard Practices Manual BHT-ALL-SPM, Chapter 3	Supplemental ICA ref: Section 5-3
A527.3 (f) Fasteners, torque values, etc (f) All data relative to structural fasteners such as identification, discard recommendations, and torque values.	ICA ref: Bell Standard Practices Manual BHT-ALL-SPM, Chapter 2	Supplemental ICA ref: Section 32-6
A527.3 (g) Special tools (g) A list of special tools needed.	ICA ref: N/A	Supplemental ICA ref: N/A

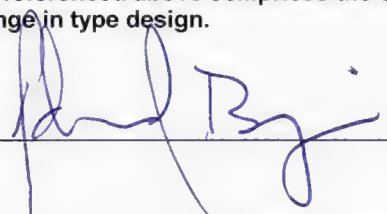
MSI 53 – Review of Supplemental Instructions for Continued Airworthiness

BLOCK 3

Note: The statement in block 5 does not constitute an approval of the Airworthiness Limitations Section. Airworthiness Limitations differ from other maintenance tasks, in that they are mandatory, as a direct condition of the approval of the type design. They are therefore referenced directly in the approval document itself. However, they must also be included in the Supplemental Instructions for Continued Airworthiness.

A527.4 AWL - Separate Section 1 The Instructions for Continued Airworthiness must contain a section titled Airworthiness Limitations that is segregated and clearly distinguishable from the rest of the document. This section must set forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure approved under 527.571. If the Instructions for Continued Airworthiness consist of multiple documents, the section required by this paragraph must be included in the principal manual. This section must contain a legible statement in a prominent location that reads: "The Airworthiness Limitations section is approved by the Minister and specifies maintenance required by any applicable airworthiness or operating rule unless an alternative program has been approved by the Minister."	ICA ref: Bell 206L Series Maintenance Manual, Chapter 4	Supplemental ICA ref: Chapter 4
---	---	---------------------------------

BLOCK 4 – Applicant Statement of Compliance

The Supplemental ICA referenced above comprises the complete listing of supplemental ICA necessary to show compliance with the regulatory standard that supports this change in type design.	
Applicants Signature: 	Date: <u>5 MAY 2006</u>
Applicants Name: <u>E. Burgoin, P.Eng, DAR 290M</u>	

BLOCK 5 – Minister's Statement of Acceptability

The design change is adequately supported by existing ICA and/or supplemental ICA, as identified above and is acceptable to the Minister.	
Reviewer's Name: _____ Phone # _____ Email: _____ Mail Routing Symbol: _____	
Signature: _____ Date: _____ NAPA Number _____	

FORM AE-100

DEPARTMENT OF TRANSPORT STATEMENT OF COMPLIANCE OF AIRCRAFT OR AIRCRAFT COMPONENTS WITH THE AIRWORTHINESS REQUIREMENTS		AE-100 No.: AE493 Initial Issue Date: 21 June, 2002 Revision: 1 Revision Date: 25 May, 2006 Approval No.: SH00-48 Delegation No.: 290M Delegate Name: E. Burgoin Classification of Designee: Employer: AERO Design Ltd.	
Aircraft Mfr: Bell Aircraft Model: 206L Registration: All Eligible		Model Type Airplane <input type="checkbox"/> Helicopter <input checked="" type="checkbox"/> Appliance <input type="checkbox"/> Component <input type="checkbox"/>	
LIST OF APPROVED REPORTS AND DATA			
Document Number		Document Title	Compliance Status
DCL493 49311 49312	Revision 6 Revision 3 Revision 4	Document Control List and all documents referred to therein Forward Fitting Aft Fitting	
		DATA APPROVED BY TRANSPORT CANADA	
ICA493.90	Revision 0	Instructions for Continued Airworthiness	
CERTIFICATION UNDER THE AUTHORITY VESTED IN ME BY THE DEPARTMENT OF TRANSPORT, I HEREBY CERTIFY THAT THE DATA LISTED ABOVE AND ON THE ATTACHED SHEETS NUMBERED Nil HAVE BEEN EXAMINED IN ACCORDANCE WITH ESTABLISHED PROCEDURES AND FOUND TO COMPLY, TO THE BEST OF MY KNOWLEDGE AND BELIEF WITH THE PERTINENT COMPLIANCE REQUIRMENTS.			
I THEREFORE <input type="checkbox"/> RECOMMEND FOR APPROVAL OF THESE DATA <input checked="" type="checkbox"/> APPROVE THESE DATA			
 E. Burgoin, DAR 290M			

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
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49320	Barrel Nut	1
ENGINEERING DOCUMENTS		
ER493.01	Engineering Report	0
ER493.03	Test Report	0
261.02	Honeycomb Insert Load Test Report	0
APPROVAL:	ORIGINAL DATE: 19 May, 2002 REVISION DATE: 10 May, 2006	AERO DESIGN LTD. 2013 – 39 th Avenue NE Calgary, Alberta T2E 6R7 Ph. (403) 250-8027 Fax. (403) 250-8333
	SHEET 1 OF 1	BELL 206L SERIES External Attachment Provisions
	DCL493	Rev. 6

AERO DESIGN LTD.

2013 – 39 Avenue N.E., Calgary, Alberta, T2E 6R7

Tel: 403-250-8027

Fax: 403-250-8333

aerodesign@telusplanet.net

22 February, 2005

Midwestern Machining
7715 – 46th Street SE
Calgary, Alberta
T2C 2Y5

Attention: Production Manager

Re: Fittings – Drawing 49346, Revision 1

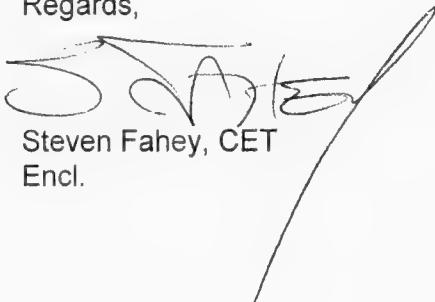
Stephen,

Enclosed are prints of the drawings describing the fittings. Please quote on production of two (2) of the fitting gangs shown in drawing 49346, Rev. 1. We cut parts from the blank and finish them in our shop as required.

Drawing 46311, Rev. 2 is included for reference, as it is the finished part. If you also want to quote a price on making all 20 parts start to finish, feel free to do so.

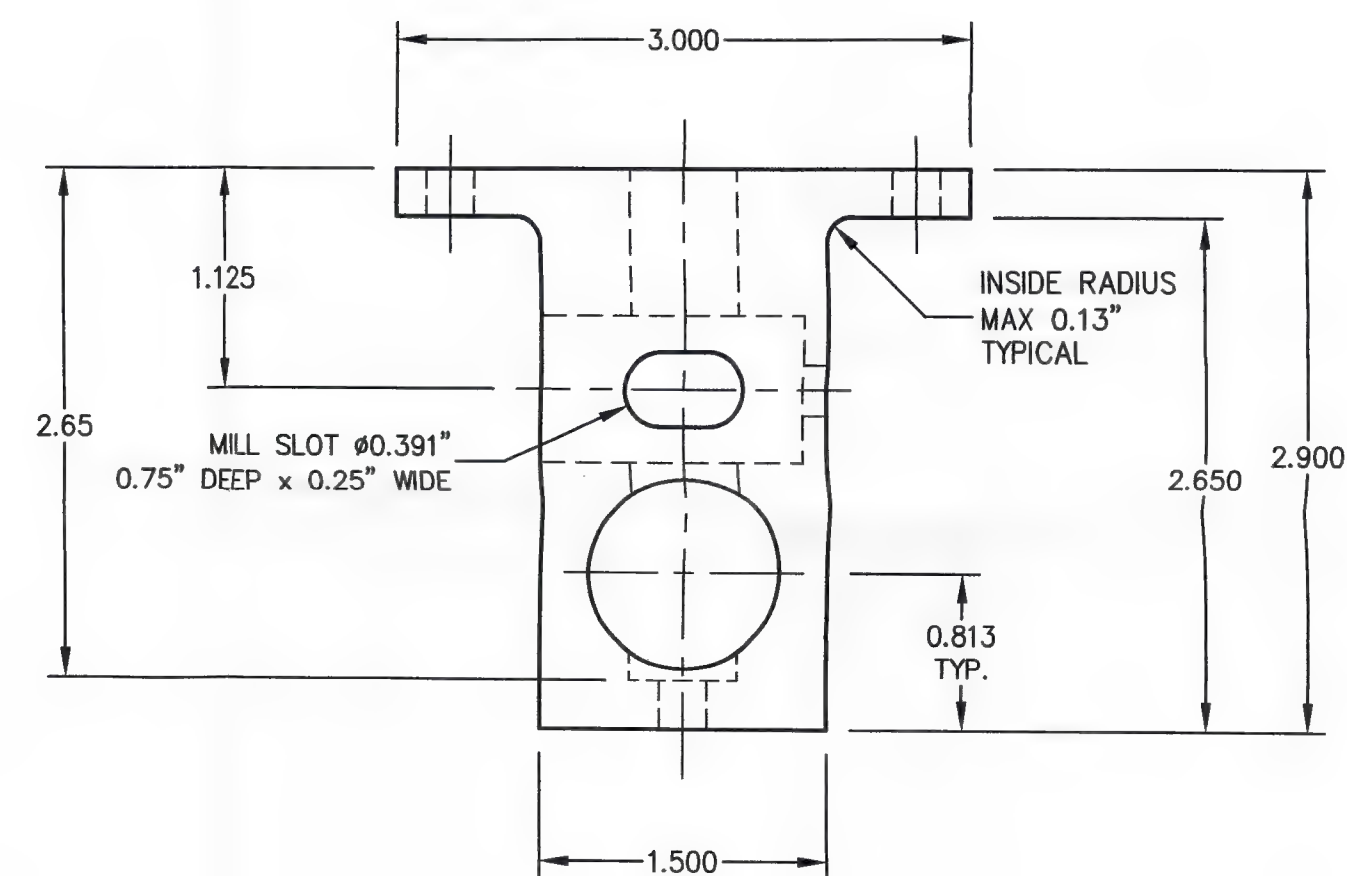
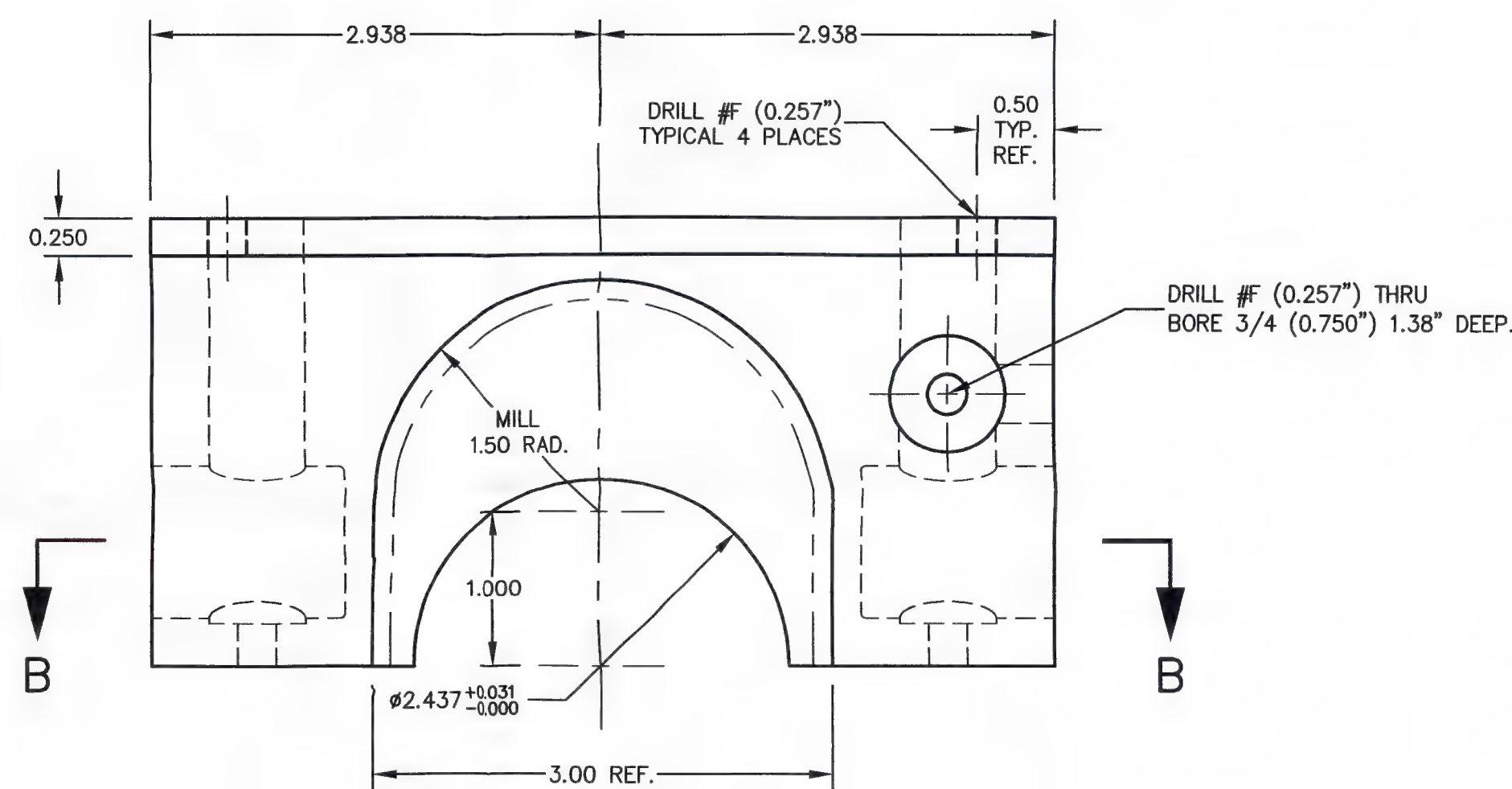
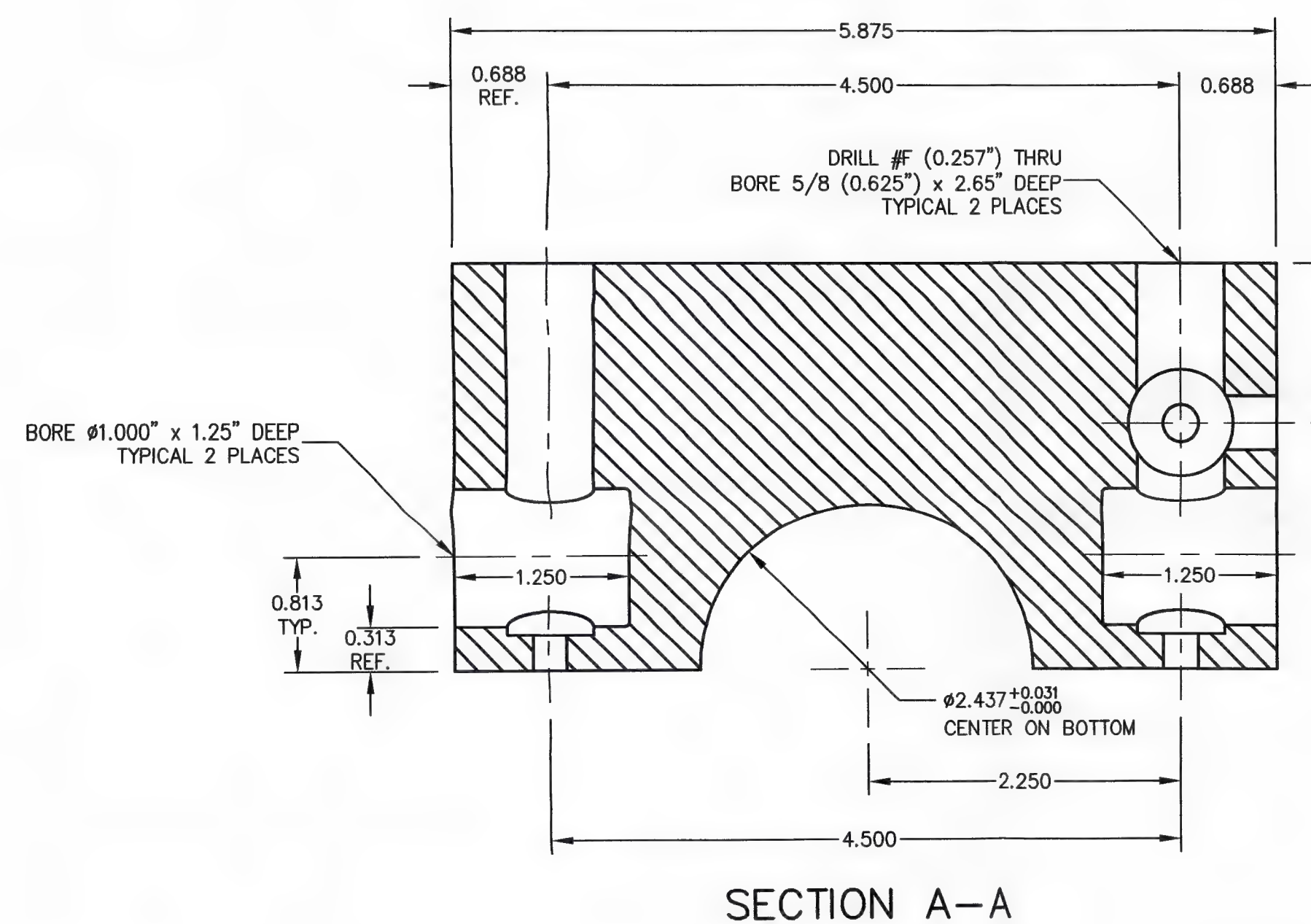
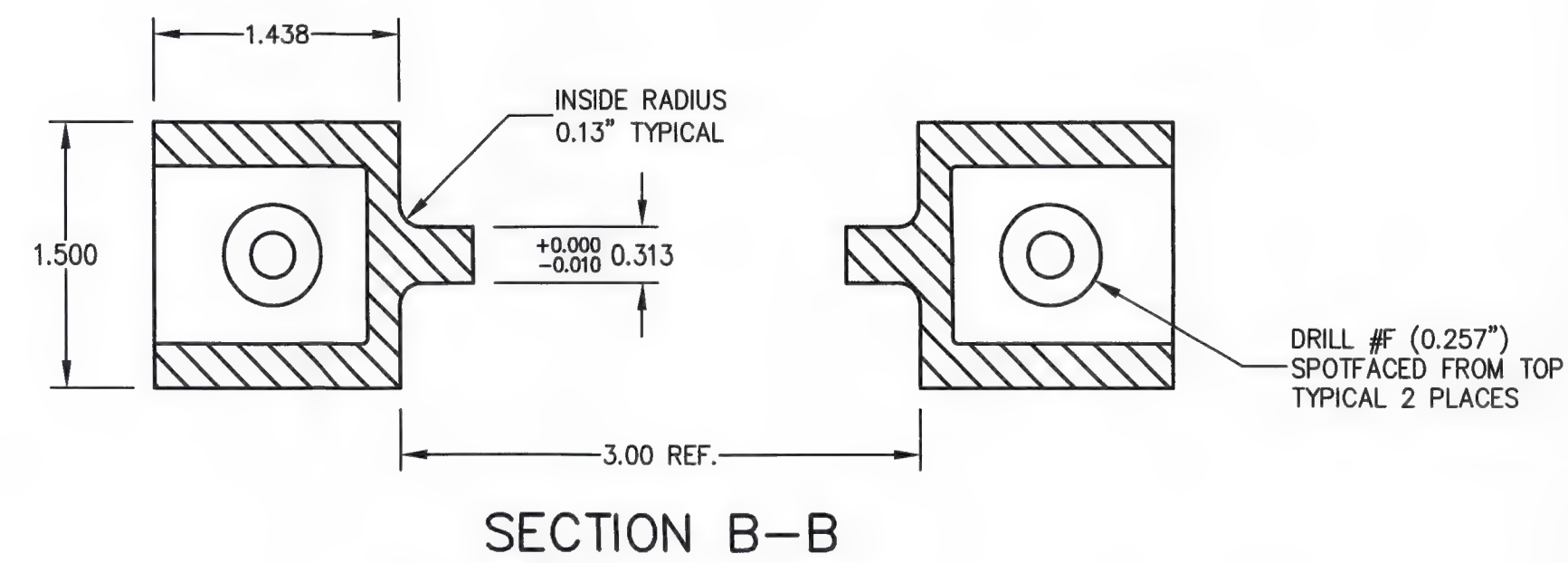
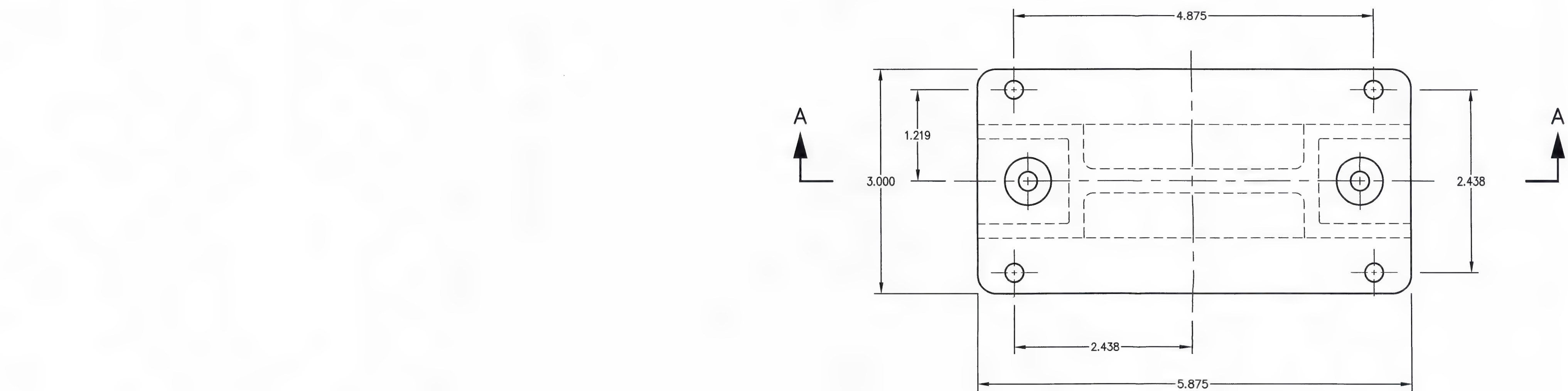
I have ordered 2 pieces of material (6.5"x32") which is scheduled to arrive before the 11th.

Regards,

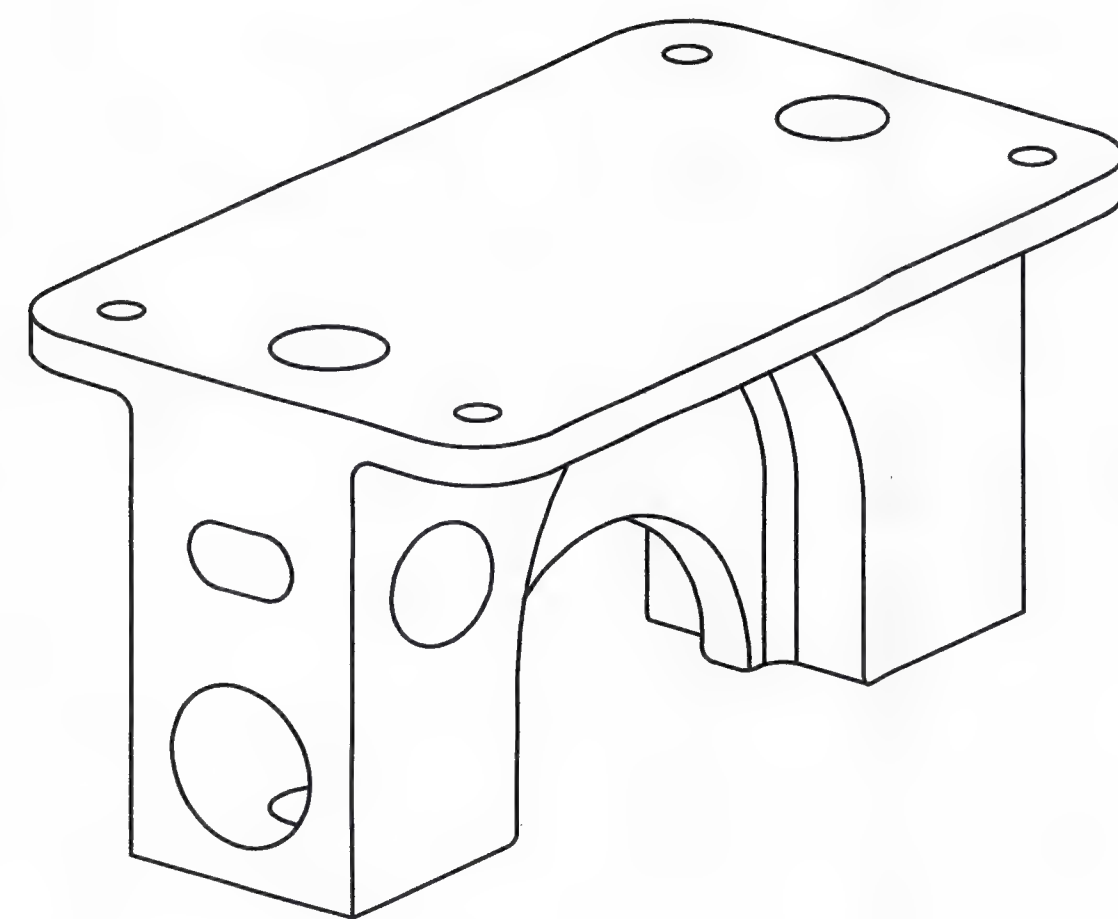
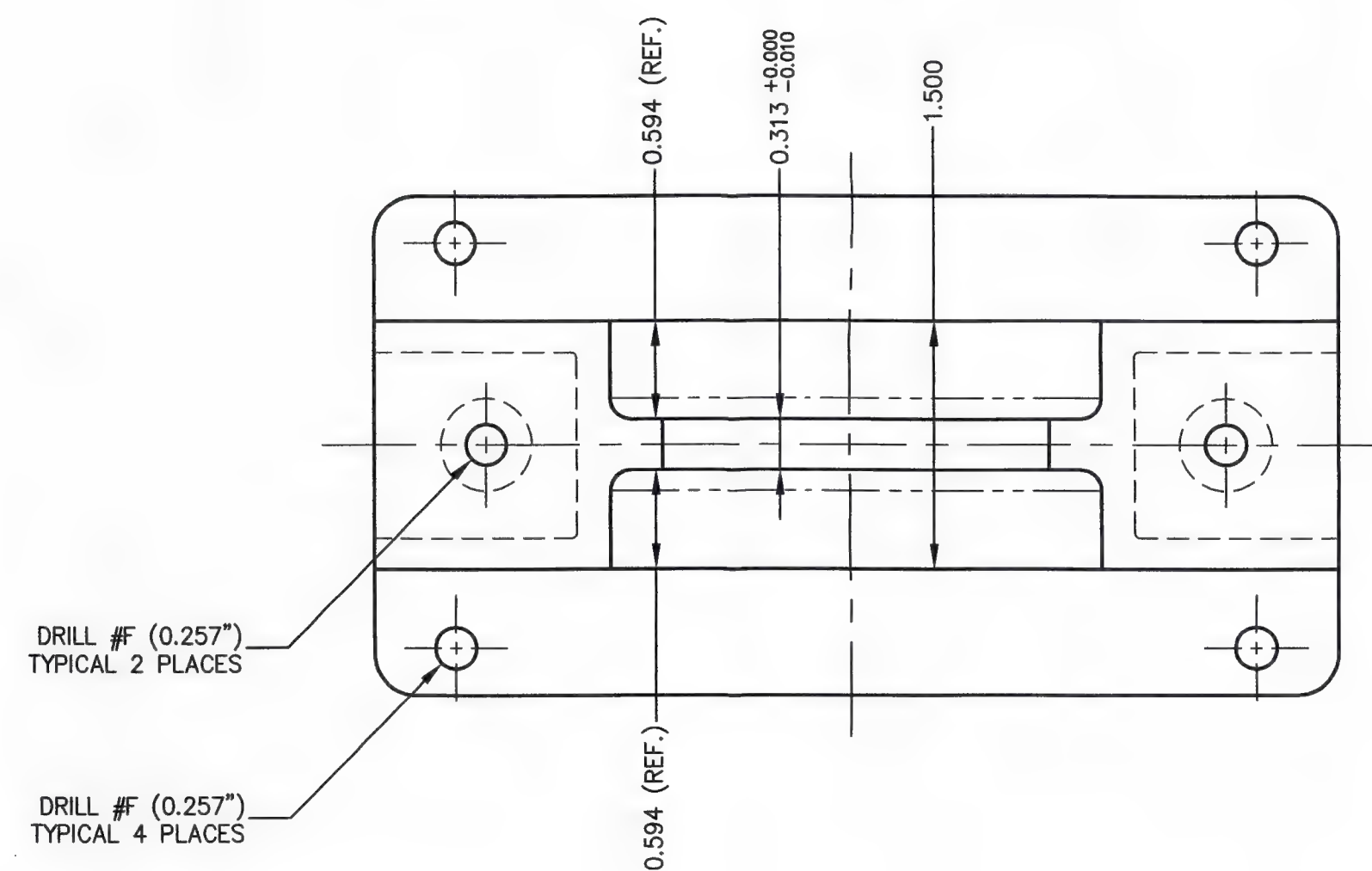
A handwritten signature in black ink, appearing to read 'S. Fahey', with a long, sweeping underline that extends to the right.

Steven Fahey, CET
Encl.

NOTICE			
THIS DRAWING CONTAINS INFORMATION AND DATA WHICH IS PROPRIETARY TO AERO DESIGN LTD. THIS DRAWING, OR ANY PORTION THEREOF, MAY NOT BE REPRODUCED, COPIED, OR DUPLICATED IN ANY MANNER, NOR USED FOR MANUFACTURING WITHOUT THE WRITTEN CONSENT OF AERO DESIGN LTD. BY ACCEPTING THIS DRAWING FOR REFERENCE, THE RECIPIENT AGREES TO HOLD AERO DESIGN LTD. HARMLESS FROM THE USE, OR MISUSE, OF THIS DRAWING OR THE INFORMATION CONTAINED THEREON.			
REV.	DESCRIPTION OF CHANGE	INITIALS	DATE
1	MANUFACTURING CHANGE: SIDE MOUNTED BARREL-NUT, BEARING DIAMETER INCREASED, FLANGE REDUCED FROM 0.40" TO 0.25" PER ER493.03	STF	JUN 17/02



01 FORWARD FITTING



- NOTES:
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
 2. THOROUGHLY CLEAN, EPOXY PRIME, AND PAINT PART PRIOR TO ASSEMBLY.

2	49311-01	01	FORWARD FITTING	6061--T651 ALUMINUM	QQ-A-250/11	3.0" PLATE
PART NO.		ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
QTY. LIST OF MATERIALS						
APPROVALS			DATE			
DRAWN: STEVEN FAHEY			APR 24/02			
CHECKED: E. BURGOIN			APR 24/02			
STRESS:						
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS ANGLES X.XXX ±0.010 X.XX ±0.03 X.X ±0.1			AERO DESIGN LTD. ENGINEERING CONSULTANTS 1045 McTAVISH ROAD N.E. CALGARY, ALBERTA T2E 7G9			
SCALE 1 : 1 SHEET 1 OF 1			BELL 206L SERIES EXTERNAL ATTACHMENT PROVISIONS FORWARD FITTING			
			DWG. SIZE	DWG. NO.	REV.	
			A1	49311	1	

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CHANGES APR/MAY 03

AERO DESIGN LTD.

1045 McTavish Rd. N. E., Calgary, Alberta, T2E 7G9

aerodesign@telusplanet.net

F A X C O V E R S H E E T

DATE: July 4, 2002

TIME: 7:57 AM

TO: Daniel Hauver
Heli-Craft

PHONE: 450-468-3431

FAX: 450-468-5497

FROM: S. Fahey
Aero Design Ltd.

PHONE: 403-250-8027

FAX: 403-250-8333

Number of pages including cover sheet: 2

RE: FITTINGS AND HARDWARE & STC

Fittings are sent back to Heli-Inter by air, yesterday afternoon. They should be in Val d'Or today. I've enclosed the approval documents in this fax.

Steve

AERO DESIGN LTD.

1045 McTavish Rd. N. E., Calgary, Alberta, T2E 7G9

aerodesign@telusplanet.net

F A X C O V E R S H E E T

DATE: July 4, 2002

TIME: 7:55 AM

TO: M. Carron

PHONE: 819-757-3030

FAX: 819-757-3303

FROM: S. Fahey
Aero Design Ltd.

PHONE: 403-250-8027

FAX: 403-250-8333

Number of pages including cover sheet: 2

RE: FITTINGS AND HARDWARE

Fittings are returned to you by air, yesterday afternoon. They should be in Val d'Or today.

Steve

014 YYC 05803770

Shipper's name and address Nom et adresse de l'expéditeur AERO DESIGN 1045 MACTAVISH RD N E CALGARY CANADA		Shipper's Account Number N° de compte de l'expéditeur 812383		NOT NEGOTIABLE AIR WAYBILL (AIR CONSIGNMENT NOTE) NON NÉGOCIABLE LETTRE DE TRANSPORT AÉRIEN ISSUED BY ÉMISE PAR AIR CANADA P.O. BOX 14000, MONTREAL	
Consignee's name and address Nom et adresse du destinataire HELI INTER 10 ROUTE 117 CP 700 MALARTIC QU CANADA		Consignee's account number N° de compte du destinataire B		It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT ON THE REVERSE HEREOF. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required. Il est convenu que les marchandises décrites dans le présent document sont acceptées pour le transport en bon état apparent (sauf annotation contraire) et que le transport est SOUMIS AUX CONDITIONS DU CONTRAT QUI FIGURENT AU VERSO. L'ATTENTION DE L'EXPÉDITEUR EST ATTIRÉE SUR L'AVIS CONCERNANT LA LIMITATION DE RESPONSABILITÉ DU TRANSPORTEUR. L'expéditeur peut augmenter cette limitation de responsabilité en déclarant une valeur pour le transport plus élevée et en payant des frais supplémentaires s'il y a lieu.	
Issuing carrier's agent, name and city Nom et ville de l'agent du transporteur émetteur VAL D'OR		Accounting Information Renseignements comptables X X X		INSURANCE - If Carrier offers insurance, and such insurance is requested in accordance with conditions on reverse hereof, indicate amount to be insured in figures in box marked 'amount of insurance'. ASSURANCE - Si le transporteur offre une assurance que l'expéditeur veut contracter conformément aux conditions décrites au verso, indiquer le montant à assurer, en chiffres, dans la case ci-contre.	
Airport of departure (address of first carrier) and requested routing Aéroport de départ (adresse du 1 ^{er} transporteur) et itinéraire demandé CALGARY		Currency Monnaie CAD		Declared value for carriage Valeur déclarée au départ N V D	
To - A Routing and destination - Itinéraire et destination By first carrier - Par 1 ^{er} transporteur YUL AC		To - A By - Per YVO AC		Declared value for customs Valeur déclarée pour le douane N C V	
Airport of destination Aéroport de destination VAL D'OR		Flight/Date Vol/date X X X		Amount of insurance Montant de l'assurance X X X	
Handling information Précisions sur le traitement de l'expédition CR1-BROKER-FRITZ STARBER					
No. of Pieces Nombre de colis 1					
Gross weight Poids brut 9.0K					
Rate Class - Classif. du tarif Commodity item no. Référence de l'article QNAF					
Chargeable weight Poids de taxation 10.0					
Rate / Charge Tarif / Montant 45.00					
Total 45.00					
Nature and quantity of goods (incl. dimensions or volume) Nature et quantité des marchandises (avec dimensions ou volume) AIRCRAFT PARTS NON HAZ					
Prepaid - Port payé 45.00					
Weight Charge - Taxation au poids 45.00					
Collect - Port dû 45.00					
Valuation charge - Taxation à la valeur 45.00					
Tax - Taxe COL- MYBDC .45/SCBDC 5.00/NSOCC 2.25/					
Total other Charges Due Agent - Total des autres frais dus à l'agent 7.70					
Total other Charges Due Carrier - Total des autres frais dus au transporteur 7.70					
Total prepaid - Total port payé 52.70					
Total collect - Total port dû 52.70					
Currency Conversion Rates Taux de conversion monnaie 03JUL02 CALGARY					
cc charges in Dest. Currency Port dû en monnaie du pays de destination 03JUL02 14:25:54					
For Carrier Use only Réservé au transporteur à destination MATCHED: 014-05803770					

NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY

IF THE CARRIAGE INVOLVES AN ULTIMATE DESTINATION OR ORIGIN IN A COUNTRY OTHER THAN THE COUNTRY OF DEPARTURE, THE WARSAW CONVENTION MAY BE APPLICABLE AND THE CONVENTION GOVERNS AND IN MOST CASES LIMITS THE LIABILITY OF THE CARRIER IN RESPECT OF LOSS, DAMAGE OR DELAY TO CARGO TO 250 FRENCH GOLD FRANCS PER KILOGRAM, UNLESS A HIGHER VALUE IS DECLARED IN ADVANCE BY THE SHIPPER AND A SUPPLEMENTARY CHARGE PAID IF REQUIRED. THE LIABILITY LIMIT OF 250 FRENCH GOLD FRANCS PER KILOGRAM IS APPROXIMATELY US \$20.00 PER KILOGRAM ON THE BASIS OF US \$42.22 PER OUNCE OF GOLD. FOR TRANSPORTATION WHOLLY WITHIN CANADA A SHIPMENT SHALL HAVE A DECLARED VALUE OF \$1.10 PER KILOGRAM (BUT NOT LESS THAN \$50.00).

CONDITIONS OF CONTRACT

- As used in this contract, "Carrier" means all air carriers that carry or undertake to carry the goods hereunder or perform any other services incidental to such air carriage. "Warsaw Convention" means the Convention for the Unification of certain Rules relating to International Carriage by Air signed at Warsaw, 12 October 1929, or that Convention as amended at The Hague, 28 September 1955, whichever may be applicable, and "French gold francs" means francs consisting of 65½ milligrams of gold with a fineness of nine hundred thousandths.
- (a) Carriage hereunder is subject to the rules relating to liability established by the Warsaw Convention unless such carriage is not "international carriage" as defined by that Convention.
(b) To the extent not in conflict with the foregoing, carriage hereunder and other services performed by each Carrier are subject to:
(i) applicable laws (including national laws implementing the Convention), government regulations, orders and requirements.
(ii) provisions herein set forth.
(iii) applicable tariffs, rules, conditions of carriage, regulations and timetables (but not the times of departure and arrival therein) of such carrier, which are made part hereof and which may be inspected at any of its offices and at airports from which it operates regular services. In transportation between a place in the United States or Canada and any place outside, thereof the applicable tariffs are the tariffs in force in those countries.
- The first Carrier's name may be abbreviated on the face hereof, the full name and its abbreviation being set forth in such Carrier's tariffs, conditions of carriage, regulations and timetables. The first Carrier's address is the airport of departure shown on the face hereof. The agreed stopping places (which may be altered by Carrier in case of necessity) are those places, except the place of departure and the place of destination, set forth on the face hereof or shown in Carrier's timetables as scheduled stopping places for the route. Carriage to be performed hereunder by several successive carriers is regarded as a single operation.
- Except as otherwise provided in Carrier's tariffs or conditions of carriage, in carriage to which the Warsaw Convention does not apply, Carrier's liability shall not exceed US \$20.00 or the equivalent per kilogramme of goods lost, damaged or delayed, unless a higher value is declared by the shipper and a supplementary charge paid.
- If the sum entered on the face of the Air Waybill as "Declared Value for Carriage" represents an amount in excess of the applicable limits of liability referred to in the above Notice, and in these Conditions, and if the shipper has paid any supplementary charge that may be required by the Carrier's tariffs, conditions of carriage or regulations, this shall constitute a special declaration of value, and in this case, Carrier's limit of liability shall be the sum so declared. Payment of claims shall be subject to proof of actual damages suffered.
- In cases of loss, damage or delay of part of the consignment, the weight to be taken into account in determining Carrier's limit of liability shall be only the weight of the package or packages concerned.
NOTE: Notwithstanding any other provision, for foreign air transportation as defined in the U.S. Federal Aviation Act, as amended, in case of loss or damage or delay of a shipment or part thereof, the weight to be used in determining the carrier's limit of liability shall be the weight which is used (or *pro rata* share in the case of a part shipment loss, damage or delay) to determine the transportation charge for such shipment.
- Any exclusion or limitation of liability applicable to Carrier shall apply to and be for the benefit of Carrier's agents, servants and representatives and any person whose aircraft is used by Carrier for carriage and its agents, servants and representatives. For purposes of this provision Carrier acts herein as agent for all such persons.
- (a) Carrier undertakes to complete the carriage hereunder with reasonable dispatch. Carrier may substitute alternate carriers or aircraft and may, without notice and with due regard to the interests of the shipper, substitute other means of transportation. Carrier is authorized to select the routing or to change or deviate from the routing shown on the face hereof. This Subparagraph is not applicable to/from USA.
(b) Carrier undertakes to complete the carriage hereunder with reasonable dispatch. Except within USA where carrier tariffs will apply, Carrier may substitute alternate carriers or aircraft and may, without notice and with due regard to the interests of the shipper, substitute other means of transportation. Carrier is authorized to select the routing or to change or deviate from the routing shown on the face hereof. This Subparagraph is applicable only to/from USA.
- Subject to the conditions herein, the Carrier shall be liable for the goods during the period they are in its charge or the charge of its agent.
- (a) Except when the Carrier has extended credit to the consignee without the written consent of the shipper, the shipper guarantees payment of all charges for carriage due in accordance with Carrier's tariffs, conditions of carriage and related regulations, applicable laws (including national laws implementing the Convention), government regulations, orders and requirements.
(b) When no part of the consignment is delivered, a claim with respect to such consignment will be entertained even though transportation charges thereon are unpaid.
- Notice of arrival of goods will be given promptly to the consignee or to the person indicated on the face hereof as the person to be notified. On arrival of the goods at the place of destination, subject to the acceptance of other instructions from the consignor prior to arrival of the goods at the place of destination, delivery will be made to, or in accordance with the instructions of the consignee. If the consignee declines to accept the goods or cannot be communicated with, disposition will be in accordance with instructions of the consignor.
- (a) The person entitled to delivery must make a complaint to the Carrier in writing in the case:
(i) of visible damage to the goods, immediately after discovery of the damage and at the latest within 14 days from receipt of the goods.
(ii) of other damage to the goods within 14 days from the date of receipt of the goods.
(iii) of delay, within 21 days of the date the goods are placed at his disposal.
(iv) of non-delivery of the goods, within 120 days from the date of the issue of the Air Waybill.
(b) For the purpose of Subparagraph (a) above, complaint in writing may be made to the Carrier whose Air Waybill was used, or to the first Carrier or to the last Carrier, or to the Carrier who performed the transportation during which the loss, damage or delay took place.
(c) Any rights to damages against Carrier shall be extinguished unless an action is brought within two years from the date of arrival at the destination, or from the date on which the aircraft ought to have arrived, or from the date on which the transportation stopped.
- The shipper shall comply with all applicable laws, and government regulations of any country to, from, through or over which the goods may be carried, including those relating to the packing, carriage or delivery of the goods, and shall furnish such information and attach such documents to this Air Waybill as may be necessary to comply with such laws and regulations. Carrier is not liable to the shipper for loss or expense due to the shipper's failure to comply with this provision.
- No agent, servant or representative of Carrier has authority to alter, modify or waive any provisions of this contract.
- On request and if the appropriate premium is paid and the fact recorded on the face hereof, the goods covered by this Air Waybill are insured under an open policy for the amount required as set out on the face hereof (recovery being limited to the actual value of goods lost or damaged provided that such amount does not exceed the insured value). The insurance is subject to the terms, conditions and coverage (from which certain risks are excluded) of the open policy, which is available for inspection at an office of the issuing Carrier by the interested party. Claims under such policy must be reported immediately to an office of Carrier.

AVIS SUR LA LIMITE DE RESPONSABILITÉ DU TRANSPORTEUR

SI LE TRANSPORT COMPORTE UNE DESTINATION FINALE OU UNE ESCALE DANS UN PAYS AUTRE QUE CELUI DU POINT DE DÉPART, IL PEUT ÊTRE SOUMIS AUX CONDITIONS DE LA CONVENTION DE VARSOVIE. CETTE CONVENTION RÉGITE ET, DANS LA PLUPART DES CAS, LIMITE LA RESPONSABILITÉ DU TRANSPORTEUR EN CAS DE Perte, AVARIE OU RETARD DE LA MARCHANDISE À 250 F FRANÇAIS OR PAR KILOGRAMME. À MOINS QU'UNE VALEUR PLUS ÉLEVÉE N'AIT ÉTÉ DÉCLARÉE D'AVANCE PAR L'EXPÉDITEUR ET QU'UN SUPPLÉMENT ÉVENTUEL N'AIT ÉTÉ PAYÉ. CETTE LIMITATION DE RESPONSABILITÉ À 250 F FRANÇAIS OR CORRESPOND APPROXIMATIVEMENT À 20 \$ PAR KILOGRAMME SUR LA BASE DE 42,22 \$ US L'ONCE D'OR. SI LE TRANSPORT A LIEU UNIQUEMENT AU CANADA, LA VALEUR DÉCLARÉE DE L'ENVOI EST DE 1,10 \$ LE KILOGRAMME, AVEC UN MINIMUM DE 50 \$.

CONDITIONS DU CONTRAT

- Au sens du présent contrat, le mot "transporteur" désigne toutes les compagnies aériennes qui effectuent ou s'engagent à effectuer le transport des marchandises en vertu de la présente ou qui rendent tout autre service en relation avec le transport. La Convention de Varsovie désigne la Convention pour l'unification de certaines règles relatives au transport aérien international, signée à Varsovie le 12 octobre 1929, ou cette même Convention telle qu'amendée à La Haye le 28 septembre 1955, selon que l'une ou l'autre est applicable, les "francs français" désignent les francs français constitués par 65½ milligrammes d'or au titre de 900 millièmes de fin.
- a) Le transport effectué en vertu des présentes conditions est soumis aux règles de responsabilité édictées par la Convention de Varsovie, sauf dans le cas où ce transport n'est pas un transport international au sens de cette Convention.
b) Dans la mesure compatible avec ce qui précède, le transport effectué et tous autres services rendus par chaque transporteur en vertu de cette lettre de transport sont régis par :
(i) la législation applicable (y compris les lois nationales ratifiant la Convention), les décisions, instructions et règlements gouvernementaux.
(ii) les présentes conditions.
(iii) les conditions générales de transport, tarifs, règlements et horaires du transporteur (à l'exclusion des heures d'arrivée et de départ), qui sont réputés faire partie intégrante du contrat de transport et qui peuvent être consultés dans les bureaux du transporteur et aux aéroports où il exploite des services réguliers. Pour les transports effectués entre un point aux États-Unis ou au Canada et tout autre lieu, les tarifs applicables sont les tarifs en vigueur dans ces pays.
- Le nom du premier transporteur peut être inscrit en abrégé sur le recto de la présente. Sa dénomination complète et abrégée doit figurer sur ses tarifs, sur ses conditions générales de transport, sur ses règlements et sur ses horaires. L'adresse du premier transporteur aérien est celle de l'aéroport du point de départ du transport, qui figure au recto de la présente. Les arrêts prévus (susceptibles d'être modifiés par le transporteur en cas de nécessité) sont les points, à l'exception des points de départ et de destination, qui sont indiqués au recto de la présente ou qui figurent aux horaires du transporteur comme des arrêts réguliers de l'itinéraire. Le transport qui doit être effectué, en vertu du présent contrat par plusieurs transporteurs successifs, est réputé ne constituer qu'une seule et même opération.
- Sauf dispositions contraires figurant dans les conditions générales de transport ou dans le tarif du transporteur, la responsabilité du transporteur est limitée, pour les transports non régis par la Convention de Varsovie, à 20 \$ US ou à un montant équivalent par kilogramme de marchandise perdue, endommagée ou dont l'acheminement a été retardé, à moins qu'une valeur plus élevée n'ait été déclarée par l'expéditeur et qu'un supplément n'ait été payé.
- Il y a déclaration spéciale d'intérêt si le montant inscrit au recto de la lettre de transport aérien comme "Valeur déclarée au départ" est supérieur aux limites applicables de responsabilité mentionnées dans l'avis ci-dessus et dans les présentes conditions de transport, et si l'expéditeur a payé le supplément prévu dans les tarifs, dans les conditions générales de transport ou dans les règlements du transporteur. Dans ce cas, la responsabilité du transporteur est limitée à la valeur déclarée. Pour qu'une réclamation donne lieu à remboursement, la preuve doit être apportée des dommages réellement subis.
- En cas de perte, d'avarie ou de retard d'une partie de l'expédition seul le poids du ou des colis en cause est pris en considération pour déterminer la limite de responsabilité du transporteur.
NOTE : Nonobstant toute autre disposition, lorsque le transport répond à la définition de "foreign air transportation" du Federal Aviation Act des États-Unis, tel que modifié, le poids utilisé pour le calcul de la limite de responsabilité du transporteur en cas de perte, d'avarie ou retard de tout ou partie d'une expédition est le poids (ou la partie du poids calculée au prorata de la partie de l'expédition touchée par la perte, l'avarie ou le retard) utilisé pour l'établissement des frais de transport de ladite expédition.
- Toute exclusion ou limitation de responsabilité applicable au transporteur s'applique également à ses agents, préposés et représentants de même qu'à toute personne dont l'aéronef viendrait à être utilisé par le transporteur, pour ce transport, ainsi qu'aux agents, préposés et représentants d'une telle personne. En ce qui concerne cette disposition, le transporteur est réputé agent de ces personnes.
- a) Le transporteur s'engage à effectuer aussi promptement que possible le transport objet de la présente. Le transporteur peut faire appel à d'autres transporteurs, utiliser d'autres aéronefs et, sans préavis et en tenant compte de l'intérêt de l'expéditeur, acheminer les marchandises par d'autres moyens de transport. Le transporteur est libre de choisir l'itinéraire par lequel la marchandise sera acheminée, il peut également modifier l'itinéraire figurant au recto de la présente. Le présent alinéa ne s'applique pas aux expéditions en provenance ou à destination des États-Unis.
b) Le transporteur s'engage à effectuer aussi promptement que possible le transport objet de la présente. À l'exception du territoire des États-Unis, où les tarifs du transporteur s'appliquent, ce dernier peut faire appel à d'autres transporteurs, utiliser d'autres aéronefs et, sans préavis et en tenant compte de l'intérêt de l'expéditeur, acheminer les marchandises par d'autres moyens de transport. Le transporteur est libre de choisir l'itinéraire par lequel la marchandise sera acheminée, il peut également modifier l'itinéraire figurant au recto de la présente. Le présent alinéa s'applique exclusivement aux expéditions en provenance ou à destination des États-Unis.
- Sous réserve des dispositions de la présente, le transporteur est responsable des marchandises durant la période où elles sont en sa possession ou celle de ses agents.
- a) Sauf lorsque le transporteur a fait crédit au destinataire sans le consentement écrit de l'expéditeur, ce dernier garantit le paiement de tous frais de transport exigibles en vertu du tarif du transporteur, de ses conditions générales de transport ou de sa réglementation, ou encore en vertu des lois applicables (y compris les lois nationales ratifiant la Convention), décisions, instructions et règlements gouvernementaux.
b) Si aucune partie de l'expédition n'est livrée, la réclamation est recevable même si les frais de transport afférents n'ont pas été acquittés.
- Le destinataire ou la personne à prévenir mentionnée au recto de la présente, est avisée promptement de l'arrivée de la marchandise. La marchandise arrivée à destination est livrée au destinataire ou conformément à ses instructions, sous réserve de l'acceptation d'autres instructions de l'expéditeur avant l'arrivée des marchandises à destination. Si le destinataire n'accepte pas la marchandise ou s'il ne peut être rejoint, la livraison est faite selon les instructions de l'expéditeur.
- a) La personne autorisée à enlever la marchandise doit adresser au transporteur une réclamation écrite dans les cas suivants :
(i) marchandise visiblement endommagée : la réclamation doit être faite dès la découverte du dommage et au plus tard dans un délai de 14 jours à compter de la date de réception de la marchandise;
(ii) autres dommages : la réclamation doit être faite dans un délai de 14 jours à compter de la date de réception.
(iii) retard : le délai est de 21 jours à compter du jour où la marchandise a été mise à sa disposition;
(iv) non-livraison : le délai est porté à 120 jours à compter de la date d'établissement de la lettre de transport aérien.
b) En ce qui concerne l'alinéa a) ci-dessus, la réclamation écrite peut être adressée au transporteur dont la lettre de transport aérien a été émise, à prendre ou au dernier transporteur, ou encore au transporteur qui a effectué le transport au cours duquel la perte, le dommage ou le retard s'est produit.
c) Toute action en responsabilité à l'encontre du transporteur doit être intentée, sous peine de déchéance, dans un délai de deux ans à compter de la date de l'arrivée à destination, de la date à laquelle l'aéronef aurait dû arriver ou de la date à laquelle le transport a été interrompu.
- L'expéditeur est tenu de se conformer aux lois et règlements gouvernementaux en vigueur dans les pays de destination, d'origine et de transit des marchandises ainsi que dans les pays survolés, y compris les dispositions relatives à l'emballage, au transport et à la livraison des marchandises. Il doit fournir tous renseignements utiles et joindre à la lettre de transport aérien tous documents exigés par ces lois et règlements. Le transporteur n'assume aucune responsabilité à l'égard de l'expéditeur ou de toute autre personne pour les dommages subis ou les dépenses engagées du fait de l'inobservation par l'expéditeur de la présente disposition.
- Aucun agent, préposé ou représentant du transporteur n'est autorisé à changer, modifier ou supprimer l'une quelconque des dispositions du présent contrat.
- Sur demande et moyennant paiement de la prime correspondante, qui devra figurer au recto de la présente, les marchandises sont assurées au moyen d'une police flottante pour le montant désigné au recto (la couverture étant limitée à la valeur réelle des marchandises perdues ou endommagées, jusqu'à concurrence de la valeur assurée). Cette couverture, qui exclut certains risques, est assujettie aux conditions de la police flottante, qui peut être consultée par la partie intéressée à un bureau du transporteur. Les demandes de règlement au titre de cette assurance doivent être adressées immédiatement à un bureau du transporteur.

PACKING SLIP

03 July, 2002

Ship to:

Heli Inter
10 Route 117
Malartic, Québec
J0Y 1Z0

(450) 468-3431

Attention:

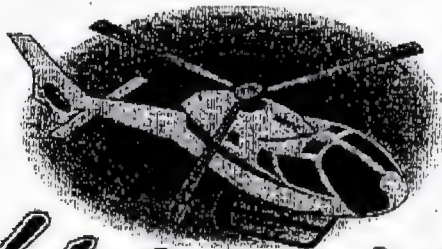
c/o: Daniel Hauver (Coast to Coast Heli)

Reference: Your Purchase Order: DH 46612

Quantity Ordered	Quantity Shipped	Description	Part Number
4	4	Forward External Attachment Fitting	49311-01 ✓
4	4	Aft External Attachment Fitting	49312-01 ✓
8	8	Barrel Nut	49320-01 ✓
8	8	Bolt	AN6-16A ✓
4	4	Bolt	NAS6605-16 ✓
4	4	Bolt	NAS6605-19 ✓
1	1	Installation Drawing – Fittings	49301, Rev. 1 ✓
1	1	Installation Drawing – Cargo Basket	49201, Rev. 0 ✓

HÉLI-INTER inc.
10, Route 117, C.P. 700
Malartic (Québec) Can.
JOY 1Z0
Tél : (819) 757-3030
Fax : (819) 757-3303

866-331-3030



Héli-Inter

À / To: AERO DESIGN	Télécopie/ Fax: (403)-250-8333
De / From: HÉLI-INTER	Date: 26-06-02
Référence / Subject: PARTS	Page (s): 2

Bonjour!

Simplement pour vous aviser que les
baguets ont été shipées, par avion,
ce matin...

S'il ya des questions à ce sujet, n'hésitez
pas à appeler!

Bonne Journée!

Martin

014 YVO 07756055

BOOKED FRT

014-07756055

Shipper's name and address Nom et adresse de l'expéditeur HELI INTER 10 ROUTE 117 CP 700 MALARTIC QU CANADA J04 1Z0		NOT NEGOTIABLE ATE WAYBILL (AIR CONSIGNMENT WAYB) NON NEGOCIABLE LETTRE DE TRANSPORT AERIEN ISSUED BY DATE FRT AIR CANADA P.O. BOX 14000, MONTREAL CA H4Y 1H4																																					
Consignee's name and address Nom et adresse du destinataire AERO DESSIGN 1045 M C TAVISH ROAD CALGARY NS CANADA		It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT ON THE REVERSE HEREOF. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required. Il est convenu que les marchandises décrites dans le présent document sont acceptées pour le transport en bon état apparent (sauf annotation contraire) et que le transport est soumis AUX CONDITIONS DU CONTRAT QUI FIGURENT AU VERSO. L'ATTENTION DE L'EXPÉDITEUR EST ATTIRÉE SUR L'AVIS CONCERNANT LA LIMITATION DE RESPONSABILITÉ DU TRANSPORTEUR. L'expéditeur peut augmenter cette limitation de responsabilité en déclarant une valeur pour le transport plus élevée et en payant des frais supplémentaires s'il y a lieu.																																					
Issuing carrier's agent, name and city Nom et ville de l'agent du transporteur émetteur CALGARY		Accounting Information Renseignements comptables W 00058 P 00058 C 00058 D 00058																																					
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Handling Information Précisions sur le traitement de l'expédition 9CT HFPU TEL 403 250 8027																																							
<table border="1"> <thead> <tr> <th>No. of Pieces Nombre de colis</th> <th>Weight Poids</th> <th>Volume Volume</th> <th>Value Valeur</th> <th>Insurance Assurance</th> <th>Remarks Remarques</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4.000</td> <td>3.0</td> <td>101.00</td> <td>101.00</td> <td>PARTS</td> </tr> <tr> <td colspan="5"> 101.00 GST NO: R100092287 </td> <td></td> </tr> <tr> <td colspan="5"> 101.00 </td> <td></td> </tr> <tr> <td colspan="5"> 18.04 </td> <td></td> </tr> <tr> <td colspan="5"> 119.04 </td> <td></td> </tr> </tbody> </table>				No. of Pieces Nombre de colis	Weight Poids	Volume Volume	Value Valeur	Insurance Assurance	Remarks Remarques	1	4.000	3.0	101.00	101.00	PARTS	101.00 GST NO: R100092287						101.00						18.04						119.04					
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JUN26 2002 VAL D'OR 014-07756055 26JUN02 12:58:34																																							

COPY - EX. 9 (FOR AGENT - AGENT)

014 YVO 07756055

ORIGINAL
BOOKED FRT

014-07756055

Shipper's name and address
Nom et adresse de l'expéditeurShipper's Account Number
N° de compte de l'expéditeur

812383

B

NOT NEGOTIABLE
AIR WAYBILL (AIR CONSIGNMENT NOTE)NON NÉGOCIABLE
LETTRÉ DE TRANSPORT AÉRIENISSUED BY
ÉMISE PAR

AIR CANADA

P.O. BOX 14000, MONTREAL CA H4Y 1H4

Copies 1, 2 and 3 of this Air Waybill are
originaux et ont la même validitéLes exemplaires 1, 2 et 3 de cette lettre de transport
sont originaux et ont la même validitéHELI INTER
10 ROUTE 117 CP 700
MALARTIC QU
CANADA J04 1Z0Consignee's name and address
Nom et adresse du destinataire *CASH*
*ONLY*Consignee's account number
N° de compte du destinataireAERO DESSIGH
1045 M C TAVISH ROAD
CALGARY NS
CANADAIssuing carrier's agent, name and city
Nom et ville de l'agent du transporteur émetteur

It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT ON THE REVERSE HEREOF. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required.

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Accounting Information
Renseignements comptablesAgent's IATA code
Code IATA de l'agentAccount no.
N° de compteAirport of departure (address of first carrier) and requested routing
Aéroport de départ (adresse du 1^{er} transporteur) et itinéraire demandé

VAL D'OR

Routing and destination - Itinéraire et destination
To - A By - Per To - A By - Per
By first carrier - Par 1^{er} transporteur

YUL AC

YYC AC

W 00058 P 00058 C 00058 D 00058

Currency
MonnaieCgo
code
frailWH / Val.
Poids / val.Other
AutreDeclared value for carriage
Valeur déclarée au départDeclared value for customs
Valeur déclarée pour la douanePPD
payéCol.
d0PPD
payéCol.
d0

CAD PXXX

XX

N V D

Airport of destination
Aéroport de destination

CALGARY

Flight/Date
Vol/dateFor Carrier Use only - Réservé au transporteur
Flight/Date
Vol/date

QK8751B/26AC1155/8

Amount of insurance
Montant de l'assurance

X

INSURANCE - If Carrier offers insurance, and such insurance is requested in accordance with conditions on reverse hereof, indicate amount to be insured in figures in box marked "amount of insurance".
ASSURANCE - Si le transporteur offre une assurance que l'expéditeur veut contracter conformément aux conditions décrites au verso, indiquer le montant à assurer, en chiffres, dans la case ci-contre.Handling information
Précisions sur le traitement de l'expédition

SCT HFPU TEL 403 250 8027

SCI

STORAGE CHARGES WILL BEGIN AFTER 0800 hours N/A

No. of Pieces Nombre de colis RCP	Gross weight Poids brut kg lb	Rate Class - Classif. du tarif Commodity item no. Référence de l'article	Chargeable weight Poids de taxation	Rate / Charge Tarif / Montant	Total	Nature and quantity of goods (incl. dimensions or volume) Nature et quantité des marchandises (avec dimensions ou volume)
1	4.0KGSCT		5.0	101.00	101.00	PARTS
1	4.0KG				101.00	

Prepaid - Port payé	Weight Charge - Taxation au poids	Collect - Port d0	Other Charges - Autres frais
101.00			MYC .20/SCC 5.00/NSOC 5.05/
Valuation charge - Taxation à la valeur			BTDC 7.79/
Tax - Taxe			1-5E/
Total other Charges Due Agent - Total des autres frais dus à l'agent			
Total other Charges Due Carrier - Total des autres frais dus au transporteur			
C	18.04		
Total prepaid - Total port payé			
Total collect - Total port d0			
P	119.04		
Currency Conversion Rates Taux de conversion monnaie			
cc charges in Dest. Currency Port d0 en monnaie du pays de destination			
1.000000CAD			
For Carrier Use only at Destination Réservé au transporteur à destination			
Charges at Destination - Frais à destination			
Total collect Charges - Total d0			
JUN26 2002 VAL D'OR			
Executed on - Établie le (Date)			
At - A (Place Lieu)			
Signature of Issuing Carrier or its Agent Signature du transporteur émetteur ou de son agent			
MATCHED:26JUN02 014-07756055			
26JUN02 22:35:18			

ORIGINAL 2 (FOR CONSIGNEE - DESTINATAIRE)***

ORIGINAL 2 (FOR CONSIGNEE - DESTINATAIRE)

NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY

IF THE CARRIAGE INVOLVES AN ULTIMATE DESTINATION OR A STOP IN A COUNTRY OTHER THAN THE COUNTRY OF DEPARTURE, THE WARSAW CONVENTION MAY BE APPLICABLE AND THE CONVENTION GOVERNS AND IN MOST CASES LIMITS THE LIABILITY OF THE CARRIER IN RESPECT OF LOSS, DAMAGE OR DELAY TO CARGO TO 250 FRENCH GOLD FRANCS PER KILOGRAM, UNLESS A HIGHER VALUE IS DECLARED IN ADVANCE BY THE SHIPPER AND A SUPPLEMENTARY CHARGE PAID IF REQUIRED. THE LIABILITY LIMIT OF 250 FRENCH GOLD FRANCS PER KILOGRAM IS APPROXIMATELY US \$20.00 PER KILOGRAM ON THE BASIS OF US \$42.22 PER OUNCE OF GOLD. FOR TRANSPORTATION WHOLLY WITHIN CANADA A SHIPMENT SHALL HAVE A DECLARED VALUE OF \$1.10 PER KILOGRAM (BUT NOT LESS THAN \$50.00).

CONDITIONS OF CONTRACT

- As used in this contract, "Carrier" means all air carriers that carry or undertake to carry the goods hereunder or perform any other services incidental to such air carriage. "Warsaw Convention" means the Convention for the Unification of certain Rules relating to International Carriage by Air signed at Warsaw, 12 October 1929, or that Convention as amended at The Hague, 28 September 1955, whichever may be applicable, and "French gold francs" means francs consisting of 65½ milligrams of gold with a fineness of nine hundred thousandths.
- (a) Carriage hereunder is subject to the rules relating to liability established by the Warsaw Convention unless such carriage is not "international carriage" as defined by that Convention.
(b) To the extent not in conflict with the foregoing, carriage hereunder and other services performed by each Carrier are subject to:
 - applicable laws (including national laws implementing the Convention), government regulations, orders and requirements.
 - provisions herein set forth.
 - applicable tariffs, rules, conditions of carriage, regulations and timetables (but not the times of departure and arrival therein) of such carrier, which are made part hereof and which may be inspected at any of its offices and at airports from which it operates regular services. In transportation between a place in the United States or Canada and any place outside, thereof the applicable tariffs are the tariffs in force in those countries.
- The first Carrier's name may be abbreviated on the face hereof, the full name and its abbreviation being set forth in such Carrier's tariffs, conditions of carriage, regulations and timetables. The first Carrier's address is the address of departure shown on the face hereof. The agreed stopping places (which may be altered by Carrier in case of necessity) are those places, except the place of departure and the place of destination, set forth on the face hereof or shown in Carrier's timetables as scheduled stopping places for the route. Carriage to be performed hereunder by several successive carriers is regarded as a single operation.
- Except as otherwise provided in Carrier's tariffs or conditions of carriage, in carriage to which the Warsaw Convention does not apply, Carrier's liability shall not exceed US \$20.00 or the equivalent per kilogramme of goods lost, damaged or delayed, unless a higher value is declared by the shipper and a supplementary charge paid.
- If the sum entered on the face of the Air Waybill as "Declared Value for Carriage" represents an amount in excess of the applicable limits of liability referred to in the above Notice, and in these Conditions, and if the shipper has paid any supplementary charge that may be required by the Carrier's tariffs, conditions of carriage or regulations, this shall constitute a special declaration of value, and in this case, Carrier's limit of liability shall be the sum so declared. Payment of claims shall be subject to proof of actual damages suffered.
- In cases of loss, damage or delay of part of the consignment, the weight to be taken into account in determining Carrier's limit of liability shall be only the weight of the package or packages concerned.
NOTE: Notwithstanding any other provision, for foreign air transportation as defined in the U.S. Federal Aviation Act, as amended, in case of loss or damage or delay of a shipment or part thereof, the weight to be used in determining the carrier's limit of liability shall be the weight which is used (or a pro rata share in the case of a part shipment loss, damage or delay) to determine the transportation charge for such shipment.
- Any exclusion or limitation of liability applicable to Carrier shall apply to and be for the benefit of Carrier's agents, servants and representatives and to any person whose aircraft is used by Carrier for carriage and its agents, servants and representatives. For purposes of this provision Carrier acts herein as agent for all such persons.
- (a) Carrier undertakes to complete the carriage hereunder with reasonable dispatch. Carrier may substitute alternate carriers or aircraft and may, without notice and with due regard to the interests of the shipper, substitute other means of transportation. Carrier is authorized to select the routing or to change or deviate from the routing shown on the face hereof. This Subparagraph is not applicable to/from USA.
(b) Carrier undertakes to complete the carriage hereunder with reasonable dispatch. Except within USA where carrier tariffs will apply, Carrier may substitute alternate carriers or aircraft and may, without notice and with due regard to the interests of the shipper, substitute other means of transportation. Carrier is authorized to select or to change or deviate from the routing shown on the face hereof. This Subparagraph is applicable only to/from USA.
- Subject to the conditions herein, the Carrier shall be liable for the goods during the period they are in its charge or the charge of its agent.
- (a) Except when the Carrier has extended credit to the consignee without the written consent of the shipper, the shipper guarantees payment of all charges for carriage due in accordance with Carrier's tariffs, conditions of carriage and related regulations, applicable laws (including national laws implementing the Convention), government regulations, orders and requirements.
(b) When no part of the consignment is delivered, a claim with respect to such consignment will be entertained even though transportation charges thereon are unpaid.
- Notice of arrival of goods will be given promptly to the consignee or to the person indicated on the face hereof as the person to be notified. On arrival of the goods at the place of destination, subject to the acceptance of other instructions from the consignor prior to arrival of the goods at the place of destination, delivery will be made to, or in accordance with the instructions of the consignee. If the consignee declines to accept the goods or cannot be communicated with, disposition will be in accordance with instructions of the consignor.
- (a) The person entitled to delivery must make a complaint to the Carrier in writing in the case:
 - of visible damage to the goods, immediately after discovery of the damage and at the latest within 14 days from receipt of the goods.
 - of other damage to the goods within 14 days from the date of receipt of the goods.
 - of delay, within 21 days of the date the goods are placed at his disposal.
 - of non-delivery of the goods, within 120 days from the date of the issue of the Air Waybill.
(b) For the purpose of Subparagraph (a) above, complaint in writing may be made to the Carrier whose Air Waybill was used, or to the first Carrier or to the last Carrier, or to the Carrier who performed the transportation during which the loss, damage or delay took place.
(c) Any rights to damages against Carrier shall be extinguished unless an action is brought within two years from the date of arrival at the destination, or from the date on which the aircraft ought to have arrived, or from the date on which the transportation stopped.
- The shipper shall comply with all applicable laws, and government regulations of any country to, from, through or over which the goods may be carried, including those relating to the packing, carriage or delivery of the goods, and shall furnish such information and attach such documents to this Air Waybill as may be necessary to comply with such laws and regulations. Carrier is not liable to the shipper for loss or expense due to the shipper's failure to comply with this provision.
- No agent, servant or representative of Carrier has authority to alter, modify or waive any provisions of this contract.
- On request and if the appropriate premium is paid and the fact recorded on the face hereof, the goods covered by this Air Waybill are insured under an open policy, for the amount requested as set out on the face hereof (recovery being limited to the actual value of goods lost or damaged provided that such amount does not exceed the insured value). The insurance is subject to the terms, conditions and coverage (from which certain risks are excluded) of the open policy, which is available for inspection at an office of the issuing Carrier by the interested party. Claims under such policy must be reported immediately to an office of Carrier.

AVIS SUR LA LIMITE DE RESPONSABILITÉ DU TRANSPORTEUR

SI LE TRANSPORT COMPORTE UNE DESTINATION FINALE OU UNE ESCALE DANS UN PAYS AUTRE QUE CELUI DU POINT DE DÉPART, LE PRESENT SOUSMIS AUX CONDITIONS DE LA CONVENTION DE VARSOVIE. CETTE CONVENTION RÉGIT ET, DANS LA PLUPART DES CAS, LIMITE LA RESPONSABILITÉ DU TRANSPORTEUR EN CAS DE Perte, AVARIE OU RETARD DE LA MARCHANDISE, À 250 F FRANÇAIS OR PAR KILOGRAMME, À MOINS QU'UNE VALEUR PLUS ÉLEVÉE N'AIT ÉTÉ DÉCLARÉE D'AVANCE PAR L'EXPÉDITEUR ET QU'UN SUPPLÉMENT ÉVENTUEL N'AIT ÉTÉ PAYÉ. CETTE LIMITATION DE RESPONSABILITÉ À 250 F FRANÇAIS OR CORRESPOND APPROXIMATIVEMENT À 20 \$ PAR KILOGRAMME SUR LA BASE DE 42,22 \$ US L'ONCE D'OR. SI LE TRANSPORT A LIEU UNIQUEMENT AU CANADA, LA VALEUR DÉCLARÉE DE L'ENVOI EST DE 1,10 \$ LE KILOGRAMME, AVEC UN MINIMUM DE 50 \$.

CONDITIONS DU CONTRAT

- Au sens du présent contrat, le mot "transporteur" désigne toutes les compagnies aériennes qui effectuent ou s'engagent à effectuer le transport des marchandises en vertu de la présente ou qui rendent tout autre service en relation avec ce transport. La Convention de Varsovie désigne la Convention pour l'unification de certaines règles relatives au transport aérien international, signée à Varsovie le 12 octobre 1929, ou cette même Convention telle qu'amendée à La Haye le 28 septembre 1955, selon que l'une ou l'autre est applicable, les "francs français or" désignent les francs français constitués par 65½ milligrammes d'or au titre de 900 millièmes de fin.
- a) Le transport effectué en vertu des présentes conditions est soumis aux règles de responsabilité édictées par la Convention de Varsovie, sauf dans le cas où ce transport n'est pas un transport international au sens de cette Convention.
b) Dans la mesure compatible avec ce qui précède, le transport effectué et tous autres services rendus par chaque transporteur en vertu de cette lettre de transport sont régis par :
 - la législation applicable (y compris les lois nationales ratifiant la Convention), les décisions, instructions et règlements gouvernementaux.
 - les présentes conditions.
 - les conditions générales de transport, tarifs, règlements et horaires du transporteur (à l'exclusion des heures d'arrivée et de départ), qui sont réputés faire partie intégrante du contrat de transport et qui peuvent être consultés dans les bureaux du transporteur et aux aéroports où il exploite des services réguliers. Pour les transports effectués entre un point aux États-Unis ou au Canada et tout autre lieu, les tarifs applicables sont les tarifs en vigueur dans ces pays.
- Le nom du premier transporteur peut être inscrit en abrégé sur le recto de la présente. Sa dénomination complète et abrégée doit figurer sur ses tarifs, sur ses conditions générales de transport, sur ses règlements et sur ses horaires. L'adresse du premier transporteur aérien est celle de l'aérodrome du point de départ du transport, qui figure au recto de la présente. Les arrêts prévus (susceptibles d'être modifiés par le transporteur en cas de nécessité) sont les points, à l'exception des points de départ et de destination, qui sont indiqués au recto de la présente ou qui figurent aux horaires du transporteur comme des arrêts réguliers de l'itinéraire. Le transport qui doit être effectué, en vertu du présent contrat par plusieurs transporteurs successifs, est réputé ne constituer qu'une seule et même opération.
- Sauf dispositions contraires figurant dans les conditions générales de transport ou dans le tarif du transporteur, la responsabilité du transporteur est limitée, pour les transports non régis par la Convention de Varsovie, à 20 \$ US ou à un montant équivalent par kilogramme de marchandise perdue, endommagée ou dont l'acheminement a été retardé, à moins qu'une valeur plus élevée n'ait été déclarée par l'expéditeur et qu'un supplément n'ait été payé.
- Il y a déclaration spéciale d'intérêt si le montant inscrit au recto de la lettre de transport aérien comme "Valeur déclarée au départ" est supérieur aux limites applicables de responsabilité mentionnées dans l'avis ci-dessus et dans les présentes conditions de transport, et si l'expéditeur a payé le supplément prévu dans les tarifs, dans les conditions générales de transport ou dans les règlements du transporteur. Dans ce cas, la responsabilité du transporteur est limitée à la valeur déclarée. Pour qu'une réclamation donne lieu à remboursement, la preuve doit être apportée des dommages réellement subis.
- En cas de perte, d'avarie ou de retard d'une partie de l'expédition seul le poids du ou des colis en cause est pris en considération pour déterminer la limite de responsabilité du transporteur.
NOTE : Nonobstant toute autre disposition, lorsque le transport répond à la définition de "foreign air transportation" du Federal Aviation Act des États-Unis, tel que modifié, le poids utilisé pour le calcul de la limite de responsabilité du transporteur en cas de perte, d'avarie ou retard de tout ou partie d'une expédition est le poids (ou la partie du poids calculée au prorata de la partie de l'expédition touchée par la perte, l'avarie ou le retard) utilisé pour l'établissement des frais de transport de ladite expédition.
- Toute exclusion ou limitation de responsabilité applicable au transporteur s'applique également à ses agents, préposés et représentants de même qu'à toute personne dont l'aéronef viendrait à être utilisé par le transporteur pour ce transport, ainsi qu'aux agents, préposés et représentants d'une telle personne. En ce qui concerne cette disposition, le transporteur est réputé agent de ces personnes.
- a) Le transporteur s'engage à effectuer aussi promptement que possible le transport objet de la présente. Le transporteur peut faire appel à d'autres transporteurs, utiliser d'autres aéronefs et, sans préavis et en tenant compte de l'intérêt de l'expéditeur, acheminer les marchandises par d'autres moyens de transport. Le transporteur est libre de choisir l'itinéraire par lequel la marchandise sera acheminée, il peut également modifier l'itinéraire figurant au recto de la présente. Le présent alinéa ne s'applique pas aux expéditions en provenance ou à destination des États-Unis.
b) Le transporteur s'engage à effectuer aussi promptement que possible le transport objet de la présente. À l'exception du territoire des États-Unis, où les tarifs du transporteur s'appliquent, ce dernier peut faire appel à d'autres transporteurs, utiliser d'autres aéronefs et, sans préavis et en tenant compte de l'intérêt de l'expéditeur, acheminer les marchandises par d'autres moyens de transport. Le transporteur est libre de choisir l'itinéraire par lequel la marchandise sera acheminée, il peut également modifier l'itinéraire figurant au recto de la présente. Le présent alinéa s'applique exclusivement aux expéditions en provenance ou à destination des États-Unis.
- Sous réserve des dispositions de la présente, le transporteur est responsable des marchandises durant la période où elles sont en sa possession ou celle de ses agents.
- a) Sauf lorsque le transporteur a fait crédit au destinataire sans le consentement écrit de l'expéditeur, ce dernier garantit le paiement de tous frais de transport exigibles en vertu du tarif du transporteur, de ses conditions générales de transport ou de sa réglementation, ou encore en vertu des lois applicables (y compris les lois nationales ratifiant la Convention), décisions, instructions et règlements gouvernementaux.
b) Si aucune partie de l'expédition n'est livrée, la réclamation est recevable même si les frais de transport afférents n'ont pas été acquittés.
- Le destinataire ou la personne à prévenir mentionnée au recto de la présente, est avisée promptement de l'arrivée de la marchandise. La marchandise arrivée à destination est livrée au destinataire ou conformément à ses instructions, sous réserve de l'acceptation d'autres instructions de l'expéditeur avant l'arrivée de la marchandise au destinataire. Si le destinataire n'accepte pas la marchandise ou s'il ne peut être rejoint, la livraison est faite selon les instructions de l'expéditeur.
- a) La personne autorisée à enlever la marchandise doit adresser au transporteur une réclamation écrite dans les cas suivants :
 - marchandise visiblement endommagée : la réclamation doit être faite dès la découverte du dommage et au plus tard dans un délai de 14 jours à compter de la date de réception de la marchandise;
 - autres dommages : la réclamation doit être faite dans un délai de 14 jours à compter de la date de réception;
 - retard : le délai est de 21 jours à compter du jour où la marchandise a été mise à sa disposition;
 - non-livraison : le délai est porté à 120 jours à compter de la date d'établissement de la lettre de transport aérien.
b) En ce qui concerne l'alinéa a) ci-dessus, la réclamation écrite peut être adressée au transporteur dont la lettre de transport aérien a été utilisée, au premier ou au dernier transporteur, ou encore au transporteur qui a effectué le transport au cours duquel la perte, le dommage ou le retard s'est produit.
c) Toute action en responsabilité à l'encontre du transporteur doit être intentée, sous peine de déchéance, dans un délai de deux ans à compter de la date de l'arrivée à destination, de la date à laquelle l'aéronef aurait dû arriver ou de la date à laquelle le transport a été interrompu.
- L'expéditeur est tenu de se conformer aux lois et règlements gouvernementaux en vigueur dans les pays de destination, d'origine et de transit des marchandises ainsi que dans les pays survolés, y compris les dispositions relatives à l'emballage, au transport et à la livraison des marchandises. Il doit fournir tous renseignements utiles et joindre à la lettre de transport aérien tous documents exigés par ces lois et règlements. Le transporteur n'assume aucune responsabilité à l'égard de l'expéditeur ou de toute autre personne pour les dommages subis ou les dépenses engagées du fait de l'inobservation par l'expéditeur de la présente disposition.
- Aucun agent, préposé ou représentant du transporteur n'est autorisé à changer, modifier ou supprimer l'une quelconque des dispositions du présent contrat.
- Sur demande et moyennant paiement de la prime correspondante, qui devra figurer au recto de la présente, les marchandises sont assurées au moyen d'une police flottante pour le montant désigné au recto (la couverture étant limitée à la valeur réelle des marchandises perdues ou endommagées, jusqu'à concurrence de la valeur assurée). Cette couverture, qui exclut certains risques, est assujettie aux conditions générales de la police flottante. Si le destinataire ou le destinataire intéressé à un bureau du transporteur émetteur. Les demandes de règlement au titre de cette assurance doivent être adressées immédiatement à un bureau du transporteur.

AERO DESIGN LTD.

1045 McTavish Rd. N. E., Calgary, Alberta, T2E 7G9

aerodesign@telusplanet.net

F A X C O V E R S H E E T

DATE: June 28, 2002

TIME: 1:20 PM

TO: Tony

PHONE:

Taiga

FAX: 204-943-3657

FROM: S. Fahey
Aero Design Ltd.

PHONE: 403-250-8027

FAX: 403-250-8333

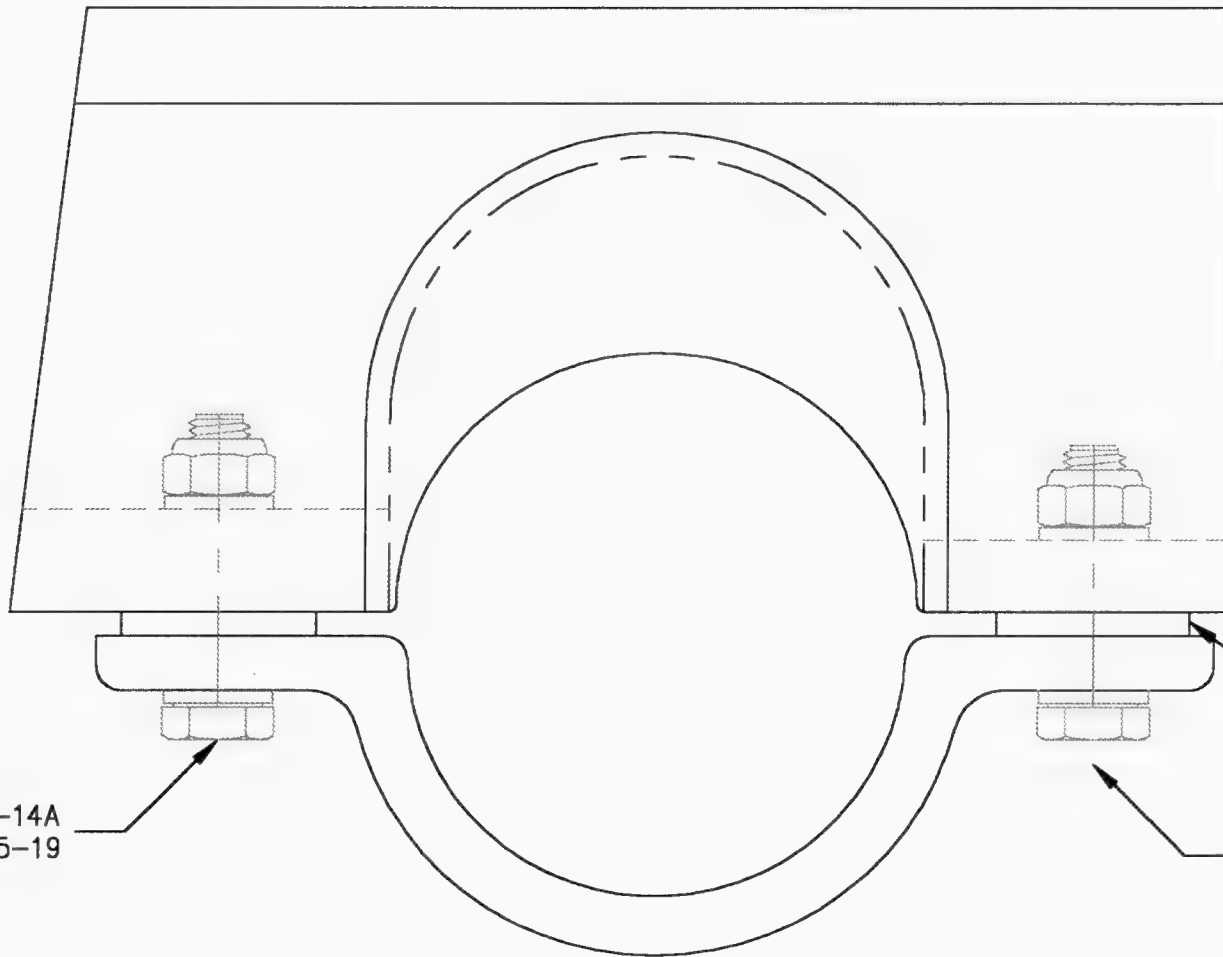
Number of pages including cover sheet: 2

RE: BOLT SIZES

These bolt sizes should work - may require an extra washer. I recommend getting AN5-12, -13, -14, -15 just to be sure. NAS bolts will be in Purolator's hands this afternoon.

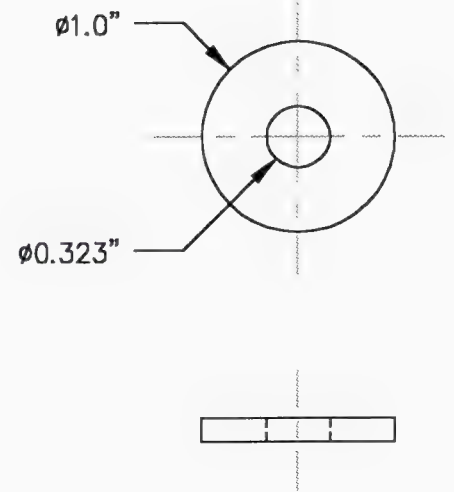
Steve

AN5-14A
NAS6605-19



AN5-13A
NAS6605-16

SHIM 49321-01
2 PLACES PER FTG.





Transport
Canada

Transports
Canada

Aircraft Certification
Prairie and Northern Region
1100-9700 Jasper Avenue
Edmonton, Alberta
T5J 4E6

Your file Votre référence

Our file Notre référence

File: **C-02-0465 (RAED)**
C-LSH02-135

June 21, 2002

Aero Design Ltd.
1045 McTavish Road, N.E.
Calgary, ALBERTA
T2E 7G9 CANADA

Dear Sir:

**RE: LIMITED SUPPLEMENTAL TYPE CERTIFICATE NO. C-LSH02-135 – ISSUE 1
DATED JUNE 19, 2002 – INSTALLATION OF LANDING GEAR FITTINGS WITH
EXTERNAL LOAD ATTACHMENT PROVISIONS – AIRCRAFT REGISTRATION
MARK C-FBHM/45066 – ISSUED TO AERO DESIGN LTD.**

This Limited Supplemental Type Certificate (LSTC) is issued in response to your application. Included herewith the LSTC are the documents bearing original TC signatures.

The transfer of this LSTC in the name of another person requires the prior approval from the Minister in accordance with Canadian Aviation Regulations (CAR) 513.25.

The provisions of AWM 561.01 are not applicable to a LSTC. The requirements of CAR 571.06(4) apply.

A Canadian Holder is required to report any service problems experienced with their product. Therefore, should you become aware of any defect, malfunction or failure resulting from the design change, it is your responsibility to submit a Service Difficulty Report to Transport Canada in accordance with CAR V, Subpart 91.

Yours truly,

for

J. Staal
Aircraft Certification Engineering Technologist
Prairie and Northern Region
Phone: (780) 495-5227
Fax: (780) 495-7963

Enclosures

cc: PAHTH Thunder Bay
Wisk-Air Ltd. (owner)

Canada



Transport Canada

Transports Canada

Department of Transport***Limited Supplemental Type Certificate*****This approval is issued to:**

Aero Design Ltd.
1045 McTavish Road, N.E.
Calgary, ALBERTA
T2E 7G9 CANADA

Number: C-LSH02-135**Issue No.:** 1**Approval Date:** June 19, 2002**Issue Date:** June 19, 2002**Responsible Office:**

Prairie and Northern

Aircraft/Engine Type or Model:

BELL 206L

Registration/Serial No.:

C-FBHM/45066

Canadian Type Certificate or Equivalent:

H-92

Description of Type Design Change:

Installation of Landing Gear fittings with external load attachment provisions.

**Installation/Operating Data,
Required Equipment and Limitations:**

Installation of the landing gear fittings with external attachment provisions is to be done in accordance with Transport Canada approved Aero Design Ltd., Document Control List DCL 493, Rev 0, dated 19 June 2002, or later approved revision. (Any external load attachment requires additional approval).

Transport Canada approved Aero Design Ltd, Flight Manual Supplement, FMS493.01, Revision 0, dated 19 May 2002 is required.

The basis of certification is as defined by the applicable TCDS, plus FAR 27 amendment 27-24.

-- END --



Conditions: This approval is only applicable to the type/model of aeronautical product specified therein. Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated **will not** adversely affect the airworthiness of the modified product.

D.S. Austen
For Minister of Transport

Canada

TRANSFER ENDORSEMENT

A transfer of ownership requires prior approval from the Minister.

The reissue of the certificate in the name of the transferee will be contingent upon a demonstration made by the new owner that he/she can fulfill the responsibilities of the holder as described in Airworthiness Manual Chapter 513.

TRANSFER OF OWNERSHIP

TO (NAME AND ADDRESS OF TRANSFeree)

FROM (NAME AND ADDRESS OF OWNER)

TRANSFER PARTICULARS (LICENSE
AGREEMENT, SALE OF RIGHTS, ETC.)

DATE OF TRANSFER

SIGNATURE (OF TRANSFERRING OWNER)

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
49301	External Attachment Provisions Installation	0
FABRICATION DOCUMENTS		
49311	Forward Fitting	Revision 1
49312	Aft Fitting	Revision 1
49320	Barrel Nut	0
49319	Fabrication Drawing – Washer	Revision 0
ENGINEERING DOCUMENTS		
ER493.01	Engineering Report	0
FMS493.01	Flight Manual Supplement	0
APPROVAL:		
 <div style="display: flex; justify-content: space-between;"> <div>Transport Canada</div> <div>Transports Canada</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> AIRCRAFT CERTIFICATION <div style="text-align: center; border-bottom: 1px solid black; margin: 5px 0;"> APPROVED </div> By <u>D. S. Austin</u> App'l No. <u>C-LSH02-135</u> App'l Date <u>2002/06/19</u> Issue No. <u>1</u> Issue Date <u>2002/06/19</u> </div>	ORIGINAL DATE: 19 June, 2002	AERO DESIGN LTD. 1045 McTavish Rd. NE Calgary, Alberta T2E 7G9 Ph. (403) 250-8027 Fax. (403) 250-8333
	REVISION DATE:	
		SHEET 1 OF 1	BELL 206L SERIES External Attachment Provisions
DCL493		Rev. 0

AERO DESIGN LTD.

FMS493.01

Approval Holder:
Aero Design Ltd.

BELL 206L SERIES

ROTORCRAFT FLIGHT MANUAL SUPPLEMENT for the INSTALLATION of EXTERNAL ATTACHMENT PROVISIONS

Supplemental Type Certificate No. SH00-48, Issue 2

Sections I, II, III and IV of this document comprise the Transport Canada Approved sections of this Flight Manual Supplement. Compliance with Section I, Limitations, is mandatory.

Section V and any subsequent sections if present are Unapproved and are provided for information only.

The information and data contained in this Flight Manual Supplement supersede or supplement that contained in the basic Approved Flight Manual for the Bell 206L Series when fitted with External Attachment Provisions. For limitations, procedures and performance not listed in this Flight Manual Supplement, refer to the Approved Flight Manual and other approved Flight Manual Supplements.

	Transport Canada	Transports Canada
AIRCRAFT CERTIFICATION DIVISION		
APPROVED		
By		
App'l No	C-LSH02-135	
App'l Date	2002/06/19	
Issue No.	1	
Issue Date	2002/06/19	
YY - MM - DD		

Revision 0
19 May, 2002

TRANSPORT CANADA APPROVED

Table of Contents

I	Limitations	3
II	Normal Procedures	3
III	Emergency Procedures	3
IV	Performance	3

I LIMITATIONS

1. Attachment of any equipment to the External Attachment Provisions must be approved by Transport Canada.

II NORMAL PROCEDURES

1. No change from basic Approved Flight Manual.

III EMERGENCY PROCEDURES

1. No change from basic Approved Flight Manual.

IV PERFORMANCE

1. No change from basic Approved Flight Manual.

MODIFICATION APPROVAL REQUEST APPLICATION FORM

MOD493A, Rev. 0

1. NAME AND ADDRESS OF APPLICANT:

AERO Design Ltd.
1045 McTavish Rd. N.E.
Calgary, AB, T2E 7G9

2. IDENTIFICATION OF PRODUCT

MAKE:

BELL

MODEL:

206L

ALL CORRESPONDANCE TO:

AERO Design Ltd.
1045 McTavish Rd. N.E.
Calgary, AB, T2E 7G9

SERIAL No.:

45066

REGISTRATION:

C-FBHM

3. REQUEST FOR:

- A. SUPPLEMENTAL TYPE CERTIFICATE (STC) ☐
- B. STC/STA REVISION ☐ STC/STA No.
- C. LIMITED SUPPLEMENTAL TYPE CERTIFICATE (LSTC) ☒
- D. LIMITED STC/STA REVISION ☐ LSTC/LSTA No.
- E. F.A.A. SUPPLEMENTAL TYPE CERTIFICATE ☐
- F. F.A.A. STC REVISION ☐ STC No.
- G. FAMILIARIZATION OF F.A.A. STC ☐ STC No.
- H. REPAIR DESIGN APPROVAL (RDC) ☐
- I. PARTS DESIGN APPROVAL (PDA) ☐

4. TITLE OF MODIFICATION OR REPAIR:

External Attachment Provisions

5. BRIEF DESCRIPTION OF MODIFICATION OR REPAIR:

Provisions that replace all four of the landing gear fittings are installed on the helicopter. Performs same function as the original fittings from Bell, but each new fitting includes provision to install equipment using a 3/8" bolt.

6. APPLICABLE TYPE APPROVAL (TA) OR TYPE CERTIFICATE (TC) DOCUMENTS:

A. TA NO. 11-92

B. TC No. H28W

C. OTHER

7. PROPOSED BASIS OF APPROVAL:

- A. SAME AS TA ☒ B. SAME AS TC ☐ C. OTHER ☐ (Please specify)

8. DOCUMENTATION CHECKLIST	REQUIRED		FOR DOT USE ONLY		
	YES	NO	RECEIVED		
			YES	NO	DATE
COMPLIANCE PROGRAM	X		✓		
MASTER DRAWING LIST	X		✓		
FLIGHT MANUAL SUPPLEMENT		X	✓		
MAINTENANCE MANUAL SUPPLEMENT		X			
INSTRUCTIONS FOR CONTINUING AIRWORTHINESS		X			
ENGINEERING REPORTS	X		✓		
DESIGN DRAWINGS		X			
MANUFACTURE DRAWINGS & INSTALLATION INSTRUCTIONS	X		✓		
ELECTRICAL LOAD ANALYSIS		X			
DRAFT STC, LSTC OR RDA		X			
WEIGHT AND MOMENT CHANGE	X		✓		
FLIGHT TEST DATA					
OTHER (Specify)					

9. APPLICANT'S REMARKS:

10. In addition to the payment of Aircraft Certification approval fees as prescribed in Canadian Aviation Regulations (CAR) Section 104, I agree to reimburse Transport Canada incremental expenses as in Aviation Regulation Directive No. 3, or equivalent, as applicable. For further details governing cost recovery, refer to AMA 513/4.

Aero Design Ltd.

PER: 

SIGNATURE OF APPLICANT


Consultant

TITLE

19 June, 2002

DATE

11.


SIGNATURE OF REGIONAL ENGINEER2002 Jun 19,
DATEStructures 

AERO Design Ltd.
1045 McTavish Road NE
Calgary, AB, T2E 7G9
email: ted.aerodesign@telusplanet.net

FACSIMILE COVER PAGE

To: Jack Staal

Fax #: 17804957963

Company: Transport Canada

From: E. Burgoin

Fax #: (403) 250-8333

Tel #: (403) 250-8027

Subject: DCL493

Sent: 6/26/02 at 7:53:34 AM

Pages: 2 (including cover)

MESSAGE:

I took all that time to get the documents on the DCL into Purolator, but didn't put in the copy of the DCL493, Revision 2, itself.

Steve

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
49301	External Attachment Provisions Installation	1
FABRICATION DOCUMENTS		
49311	Forward Fitting	0
49312	Aft Fitting	0
49311	Forward Fitting	1
49312	Aft Fitting	1
49319	Washer	0
49320	Barrel Nut	0
49320	Barrel Nut	1
49321	Spacer	0
ENGINEERING DOCUMENTS		
ER493.01	Engineering Report	0
FMS493.01	Flight Manual Supplement	0
ER493.03	Test Report	0
261.02	Honeycomb Insert Load Test Report	0
APPROVAL:	ORIGINAL DATE: 19 May, 2002 REVISION DATE: 25 June, 2002	AERO DESIGN LTD. 1045 McTavish Rd. NE Calgary, Alberta T2E 7G9 Ph. (403) 250-8027 Fax. (403) 250-8333
	SHEET 1 OF 1	BELL 206L SERIES External Attachment Provisions
	DCL493	Rev. 2

AERO DESIGN LTD.

1045 McTavish Rd. N.E.
Calgary, Alberta
T2E 7G9

25 June, 2001

Transport Canada
Aircraft Certification Division
Edmonton Aircraft Certification Office
11th Floor, Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E6

Attn: Mr. Jack Staal

Re: Installation of Cargo Basket on Bell 206L

Out file: 492
Your file: n/a

Jack:

Enclosed are the following documents to complete the submission:

Document Control List	DCL492	Rev. 1
Flight Manual Supplement	FMS492.01	Rev. 1
Flight Manual Supplement	FMS493.01	Rev. 0
Installation Drawing	49301	Rev. 1
Fabrication Drawing	49311	Rev. 1
Fabrication Drawing	49312	Rev. 1
Fabrication Drawing	49319	Rev. 0
Fabrication Drawing	49320	Rev. 0
Fabrication Drawing	49320	Rev. 1
Fabrication Drawing	49321	Rev. 1

Regards,



S. Fahey, Technologist

AERO DESIGN LTD.

1045 McTavish Rd. N. E., Calgary, Alberta, T2E 7G9

aerodesign@telusplanet.net

F A X C O V E R S H E E T

DATE: June 25, 2002

TIME: 11:28 AM

TO: Jack Staal

PHONE: 708-495-5227

FAX: 708-495-7963

FROM: S. Fahey
Aero Design Ltd.

PHONE: 403-250-8027

FAX: 403-250-8333

Number of pages including cover sheet: 7

RE: REQUESTED CHANGES TO DOCUMENTATION

This is the FMS for the basket installation (changed to reflect flight test results) and the FMS for the fittings, too.

Steve

AERO DESIGN LTD.

1045 McTavish Rd. N. E., Calgary, Alberta, T2E 7G9

aerodesign@telusplanet.net

F A X C O V E R S H E E T

DATE: June 25, 2002

TIME: 3:50 PM

TO: Mark Wiskemann
Wisk-Air

PHONE: 807-475-4510

FAX: 807-473-5485

FROM: S. Fahey
Aero Design Ltd.

PHONE: 403-250-8027

FAX: 403-250-8333

Number of pages including cover sheet: 4

RE: WEIGHT AND BALANCE DATA

Mark,

I didn't realize that I hadn't sent you these documents until you called. The AN970-5 washers are completely equivalent to the spacers we've machined, and this fact is stated in the Service Bulletin. The drawing change notice corrects the installation drawing, and refers to the SB, tying everything together.

I've ordered the NAS6605 bolts that you need, and they should be in Calgary by Thursday. As soon as I get them, I'll put them on Purolator, and they should catch up to the spacers that are still on their way. On the phone I forgot that I'd put the spacers in snail mail, because the NAS bolts hadn't arrived yet. Keep flying with the hardware as is, until the NAS bolts arrive.

Steve

Aero Design Ltd.

SERVICE BULLETIN

SB49312.01

**BELL 206L SERIES HELICOPTER
EXTERNAL ATTACHMENT PROVISIONS**

ADDITIONAL HARDWARE

Revision 0

16 June, 2002

AERO Design Ltd.
Engineering Consultants

1045 M^cTavish Road N.E., Calgary, Alberta T2E 7G9

Phone: (403) 250-8027

Fax: (403) 250-8333

E-Mail: aerodesign@telusplanet.net

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1.0 BACKGROUND

In some instances, the lower clamp may not reach the Aft External Attachment Provision Fitting on installation.

2.0 MATERIAL

AN960-516	Washers	A/R
49321-01	Shims	4

3.0 INSTRUCTIONS

To fill gap between External Attachment Fitting and Strap, perform either of the following:

- A. Add four (4) shims as shown in Figure 3.1. Install NAS6605 bolt required dash length longer than original.
- B. Insert AN970-516 washers as required per bolt (4 places). Install NAS6605 bolt required dash length longer than original.

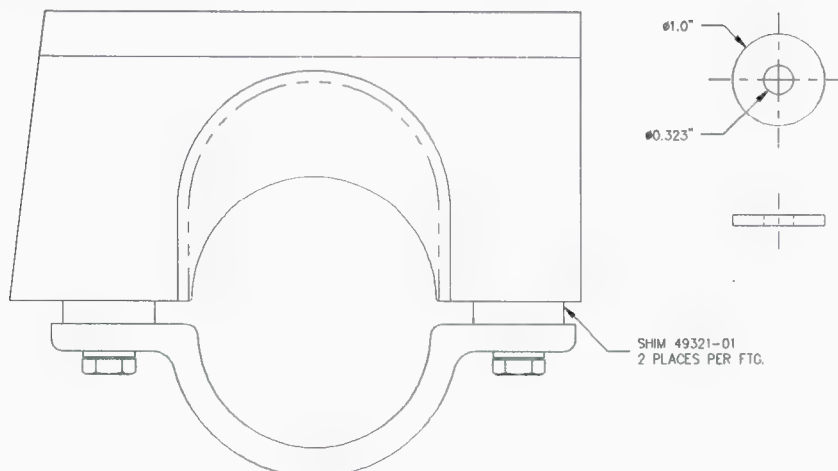
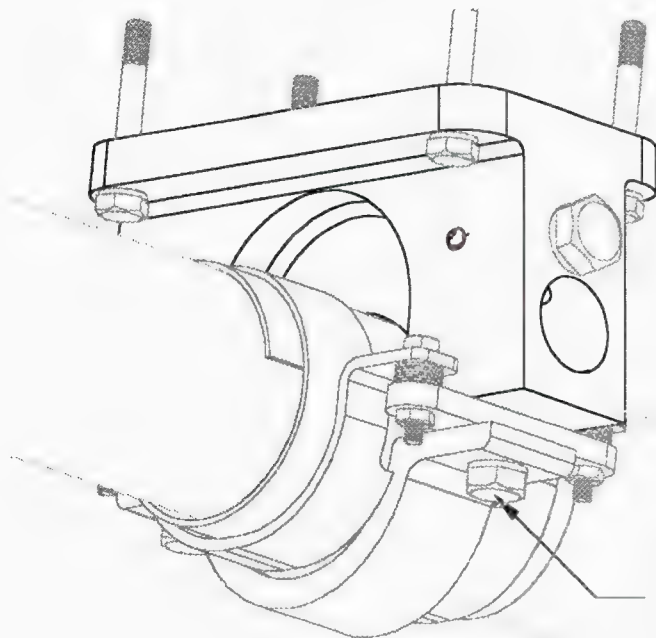


Figure 3.1 Install Spacer Between Fitting and Clamp

CHANGES

1. WHERE BOTTOM OF FITTING 49312-01 IS SPOTFACED INTERNALLY, USE ORIGINAL HARDWARE TO MOUNT LANDING GEAR CROSS-TUBE.
WHERE THE FITTING IS NOT SPOTFACED INTERNALLY, USE SEMI-CIRCULAR WASHER (49319-01) UNDER NUT.
2. SPRING SUPPORT HARDWARE MAY BE OMITTED FROM FORWARD AND/OR AFT FITTINGS PROVIDED THAT IT WAS NOT INSTALLED PREVIOUSLY.
3. REMOVE BARREL NUT FROM FITTINGS WHEN PROVISIONS ARE NOT IN USE.
DISREGARD NOTE 7 ON INSTALLATION DRAWING 49301.
4. USE SPACER 49321-01 TO FIT CLAMP TO AFT FITTING AS SHOWN IN SERVICE BULLETIN SB49321.01.



03 AFT FITTING

AN6 BOLT ORIENTED FORWARD
TYPICAL LEFT AND RIGHT

USE EXISTING HARDWARE
AND SEMI-CIRCULAR WASHER
P/N 49319-01 AS REQUIRED
TYPICAL 1 PLACE PER FITTING

4	49321-01	06	SPACER	AS REQUIRED
2	49319-01	05	SEMI-CIRCULAR WASHER	AS REQUIRED
2	49320-01	04	BARREL NUT	
2	49312-01	03	AFT FITTING	
	49301-01	01	INSTALLATION	
01	PART NO.	ITEM	DESCRIPTION	MATERIAL
QTY.	LIST OF MATERIALS			

APPROVALS		DATE	AERO DESIGN LTD. ENGINEERING CONSULTANTS 1045 McTAVISH ROAD N.E. CALGARY, ALBERTA T2E 7G9				
DRAWN: STEVEN FAHEY		JUN 06/02					
CHECKED: E. BURGOIN		JUN 06/02					
STRESS:							
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS ANGLES X.XXX ±0.010 ±1/2" X.XX ±0.03 X.X ±0.1			DRAWING CHANGE NOTICE				
			The changes indicated are applicable to the initial issue and/or to previous Drawing Change Notices for this drawing and supercede the information from the initial issue of the drawing and/or any earlier Drawing Change Notices.				
			This Drawing Change Notice must accompany the drawing it applies to at all times.				
			SCALE 1 : 1	DWG. SIZE	DWG. NO.	REV.	CHG.
			SHEET 1 OF 1	A4	49301	0	A

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
49301	External Attachment Provisions Installation	1
FABRICATION DOCUMENTS		
49311	Forward Fitting	0
49312	Aft Fitting	0
49311	Forward Fitting	1
49312	Aft Fitting	1
49319	Washer	0
49320	Barrel Nut	0
49320	Barrel Nut	1
49321	Spacer	0
ENGINEERING DOCUMENTS		
ER493.01	Engineering Report	0
FMS493.01	Flight Manual Supplement	0
ER493.03	Test Report	0
261.02	Honeycomb Insert Load Test Report	0
APPROVAL:	ORIGINAL DATE: 19 May, 2002	AERO DESIGN LTD. 1045 McTavish Rd. NE Calgary, Alberta T2E 7G9 Ph. (403) 250-8027 Fax. (403) 250-8333
	REVISION DATE: 25 June, 2002	
	SHEET 1 OF 1	BELL 206L SERIES External Attachment Provisions
	DCL493	Rev. 2

Aero Design Ltd.

SERVICE BULLETIN

SB49312.01

**BELL 206L SERIES HELICOPTER
EXTERNAL ATTACHMENT PROVISIONS**

ADDITIONAL HARDWARE

Revision 0

16 June, 2002

AERO Design Ltd.
Engineering Consultants

1045 McTavish Road N.E., Calgary, Alberta T2E 7G9

Phone: (403) 250-8027

Fax: (403) 250-8333

E-Mail: aerodesign@telusplanet.net

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1.0 BACKGROUND

In some instances, the lower clamp may not reach the Aft External Attachment Provision Fitting on installation.

2.0 MATERIAL

AN960-516	Washers	A/R
49321-01	Shims	4

3.0 INSTRUCTIONS

To fill gap between External Attachment Fitting and Strap, perform either of the following:

- A. Add four (4) shims as shown in Figure 3.1. Install NAS6605 bolt required dash length longer than original.
- B. Insert AN970-516 washers as required per bolt (4 places): Install NAS6605 bolt required dash length longer than original.

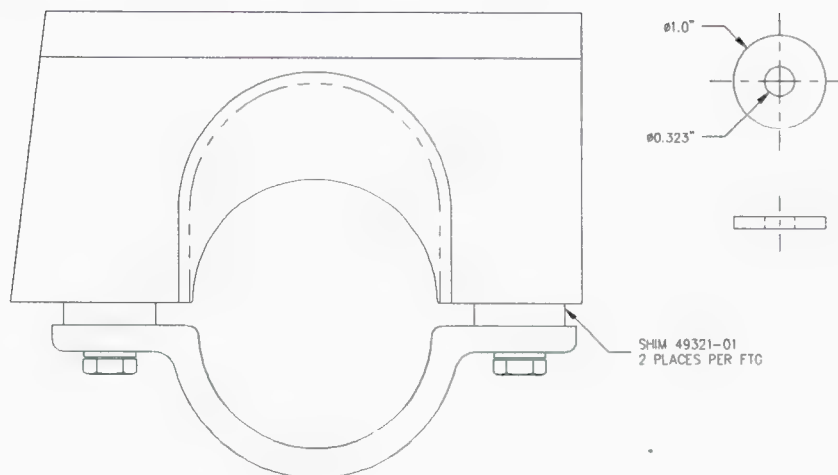


Figure 3.1 Install Spacer Between Fitting and Clamp

BELL 206L SERIES

ROTORCRAFT FLIGHT MANUAL SUPPLEMENT for the INSTALLATION of EXTERNAL ATTACHMENT PROVISIONS

Supplemental Type Certificate No. SH00-48, Issue 3

Sections I, II, III and IV of this document comprise the Transport Canada Approved sections of this Flight Manual Supplement. Compliance with Section I, Limitations, is mandatory.

Section V and any subsequent sections if present are Unapproved and are provided for information only.

The information and data contained in this Flight Manual Supplement supersede or supplement that contained in the basic Approved Flight Manual for the Bell 206L Series when fitted with External Attachment Provisions. For limitations, procedures and performance not listed in this Flight Manual Supplement, refer to the Approved Flight Manual and other approved Flight Manual Supplements.

I LIMITATIONS

1. Attachment of any equipment to the External Attachment Provisions requires Transport Canada Approval.

II NORMAL PROCEDURES

1. No change from basic Approved Flight Manual.

III EMERGENCY PROCEDURES

1. No change from basic Approved Flight Manual.

IV PERFORMANCE

1. No change from basic Approved Flight Manual.

AERO DESIGN LTD.

1045 McTavish Rd. N.E.
Calgary, Alberta
T2E 7G9

21 June, 2002

Transport Canada
Aircraft Certification Division
Edmonton Aircraft Certification Office
11th Floor, Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E6

Attn: Mr. Jack Staal

Re: Installation of Cargo Basket on Bell 206L STC

Out file: 493
Your file: SH00-48

Jack:

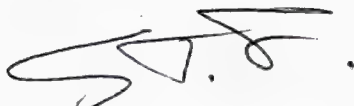
We have performed a load test on a sample specimen of the fitting. The test substantiates the reduction of the thickness of the upper flange of the fitting to the thickness of the original Bell parts (from 0.40 to 0.25 for the forward fitting, from 0.50 to 0.31 for the aft). The spotface no longer is necessary. To maintain compatibility with the first batch of fittings we made, the drawings of the original fittings are included on the DCL as approved drawings (they already are approved on the LSTC, anyway). Also included with this package is an AE100 form and a signed CP. Ted has already signed off on all delegated items.

AE100 Form	AE493.03	Rev. 0
Compliance Program	CP493	Rev. 2
Document Control List	DCL493	Rev. 1
Engineering Report	ER493.03	Rev. 0

Concerning the basket itself, the drawing list needs no changing, but I've included the copy Ted has stamped. Ted has signed off the items in his delegation on the CP.

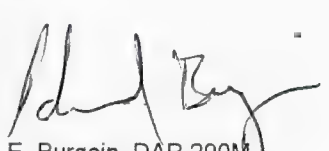
Document Control List	DCL492	Rev. 0
AE100 Form	AE492	Rev. 0
Compliance Program	CP492	Rev. 0

Regards,



S. Fahey, Technologist

FORM AE-100

<p>DEPARTMENT OF TRANSPORT STATEMENT OF COMPLIANCE OF AIRCRAFT OR AIRCRAFT COMPONENTS WITH THE AIRWORTHINESS REQUIREMENTS</p>			<p>AE-100 No.: AE493.03 Initial Issue Date: 21 June, 2002</p>
<p>Aircraft Mfr: Bell Aircraft Model: 206L Series Registration:</p>		<p>Model Type Airplane <input type="checkbox"/> Helicopter <input checked="" type="checkbox"/> Appliance <input type="checkbox"/> Component <input type="checkbox"/></p>	<p>Revision: 0 Revision Date: Approval No.: SH00-48, Issue 2 Delegation No.: 290M Delegate Name: E. Burgoin Classification of Designee: Employer: AERO Design Ltd.</p>
<p>LIST OF APPROVED REPORTS AND DATA</p>			
Document Number		Document Title	Compliance Status
DCL493	Revision 1	Document Control List and all documents referred to therein	
ER493.01	Revision 0	Engineering Report	
ER493.03	Revision 0	Test Report	
49301	Revision 1	Installation Drawing	
49311	Revision 0	Fabrication Drawing – Forward Fitting	
49311	Revision 1	Fabrication Drawing – Forward Fitting	
49312	Revision 0	Fabrication Drawing – Aft Fitting	
49312	Revision 1	Fabrication Drawing – Aft Fitting	
49319	Revision 0	Fabrication Drawing – Washer	
49320	Revision 0	Fabrication Drawing – Barrel Nut	
49320	Revision 1	Fabrication Drawing – Barrel Nut	
49321	Revision 0	Fabrication Drawing – Spacer	
DATA APPROVED BY TRANSPORT CANADA			
FMS493.01	Revision 0	Flight Manual Supplement	
<p>CERTIFICATION</p> <p>UNDER THE AUTHORITY VESTED IN ME BY THE DEPARTMENT OF TRANSPORT, I HERBY CERTIFY THAT THE DATA LISTED ABOVE AND ON THE ATTACHED SHEETS NUMBERED Nil HAVE BEEN EXAMINED IN ACCORDANCE WITH ESTABLISHED PROCEDURES AND FOUND TO COMPLY, TO THE BEST OF MY KNOWLEDGE AND BELIEF WITH THE PERTINENT COMPLIANCE REQUIRMENTS.</p> <p>I THEREFORE <input checked="" type="checkbox"/> RECOMMEND FOR APPROVAL OF THESE DATA <input type="checkbox"/> APPROVE THESE DATA</p> <p style="text-align: right;">  E. Burgoin, DAR 290M </p>			

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
49301	External Attachment Provisions Installation	1
FABRICATION DOCUMENTS		
49311	Forward Fitting	0
49312	Aft Fitting	0
49311	Forward Fitting	1
49312	Aft Fitting	1
49319	Washer	0
49320	Barrel Nut	0
49320	Barrel Nut	1
49321	Spacer	0
ENGINEERING DOCUMENTS		
ER493.01	Engineering Report	0
FMS493.01	Flight Manual Supplement	0
ER493.03	Test Report	0
APPROVAL:	ORIGINAL DATE: 19 May, 2002 REVISION DATE: 21 June, 2002	AERO DESIGN LTD. 1045 McTavish Rd. NE Calgary, Alberta T2E 7G9 Ph. (403) 250-8027 Fax. (403) 250-8333
	SHEET 1 OF 1	BELL 206L SERIES External Attachment Provisions
	DCL493	Rev. 1

AERO Design Ltd.

ENGINEERING REPORT

ER493.03

BELL 206L SERIES

EXTERNAL ATTACHMENT FITTINGS

FITTING FLANGE LOAD TEST

Revision 0

05 June, 2002

AERO Design Ltd.

Engineering Consultants

Transport Canada Approvals

1045 McTavish Road N.E., Calgary, Alberta T2E 7G9

Phone: (403) 250-8027

Fax: (403) 250-8333

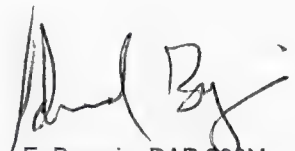
E-Mail: aerodesign@telusplanet.net

Notice: This report contains information and data which is proprietary to AERO DESIGN LTD. This report, or any portion thereof, may not be reproduced, copied, duplicated or used without the written consent of AERO DESIGN LTD.

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
49201	Cargo Basket Installation	0
FABRICATION DOCUMENTS		
49205	Cargo Basket Assembly	0
49207	Cargo Basket Lid	0
49208	Cargo Basket Body	0
49209	End Hoop Assembly	0
49210	Basket Components – Hoops	0
49211	Basket Components – Rim	0
49212	Basket Components – Rim	0
49213	Basket Components – Lid Brace	0
49214	Basket Components – Spine	0
49215	Basket Components – Spacer	0
49216	Basket Components – Spacer	0
49217	Basket Components – Lug	0
49218	Placard	0
49221	Support Beams	0
36255	Handle Assembly	0
36261	Handle Bar Assembly	0
36262	Handle Bracket Assembly	0
36271	Handle Lever	0
36272	Basket Bracket	0
36273	Lid Bracket	0
36274	Bushing	0
36275	Bushing	0
36276	Spring Hook	0
36277	Handle Bar	0
36278	Spring	0
36280	Brace	0
ENGINEERING DOCUMENTS		
ER492.01	Engineering Report – Basket Installation	0
ER492.02	Engineering Report – Basket Load Tests	0
FMS492.01	Flight Manual Supplement	0
APPROVAL:	ORIGINAL DATE: 17 May, 2002	AERO DESIGN LTD. 1045 McTavish Rd. NE Calgary, Alberta T2E 7G9 Ph. (403) 250-8027 Fax. (403) 250-8333
	REVISION DATE:	
	SHEET 1 OF 1	BELL 206L SERIES Side-Mounted Cargo Basket Installation
	<div> <div>DCL492</div> <div>Rev.</div> <div>0</div> </div>	

FORM AE-100

DEPARTMENT OF TRANSPORT STATEMENT OF COMPLIANCE OF AIRCRAFT OR AIRCRAFT COMPONENTS WITH THE AIRWORTHINESS REQUIREMENTS		AE-100 No.: AE492 Initial Issue Date: 21 June, 2002 Revision: 0 Revision Date: Approval No.: SH00-48, Issue 3 Delegation No.: 290M Delegate Name: E. Burgoin Classification of Designee: Employer: AERO Design Ltd.	
Aircraft Mfrg: Bell Aircraft Model: 206L Series Registration:	Model Type Airplane <input type="checkbox"/> Helicopter <input checked="" type="checkbox"/> Appliance <input type="checkbox"/> Component <input type="checkbox"/>		
LIST OF APPROVED REPORTS AND DATA			
Document Number	Document Title		Compliance Status
DCL492	Revision 0	Document Control List and all documents referred to therein	
ER492.01	Revision 0	Engineering Report – Basket Installation	
ER492.02	Revision 0	Engineering Report – Basket Load Tests	
49201	Revision 0	Cargo Basket Installation	
49205	Revision 0	Cargo Basket Assembly	
49207	Revision 0	Cargo Basket Lid	
49208	Revision 0	Cargo Basket Body	
49209	Revision 0	End Hoop Assembly	
49210	Revision 0	Basket Components – Hoops	
49211	Revision 0	Basket Components – Rim	
49212	Revision 0	Basket Components – Rim	
49213	Revision 0	Basket Components – Lid Brace	
49214	Revision 0	Basket Components – Spine	
49215	Revision 0	Basket Components – Spacer	
49216	Revision 0	Basket Components – Spacer	
49217	Revision 0	Basket Components – Lug	
49218	Revision 0	Placard	
49221	Revision 0	Support Beams	
36255	Revision 0	Handle Assembly	
36261	Revision 0	Handle Bar Assembly	
36262	Revision 0	Handle Bracket Assembly	
36271	Revision 0	Handle Lever	
36272	Revision 0	Basket Bracket	
36273	Revision 0	Lid Bracket	
36274	Revision 0	Bushing	
36275	Revision 0	Bushing	
36276	Revision 0	Spring Hook	
36277	Revision 0	Handle Bar	
36278	Revision 0	Spring	
36280	Revision 0	Brace	
		DATA APPROVED BY TRANSPORT CANADA	
FMS492.01	Revision 0	Flight Manual Supplement	
CERTIFICATION			
UNDER THE AUTHORITY VESTED IN ME BY THE DEPARTMENT OF TRANSPORT, I HERBY CERTIFY THAT THE DATA LISTED ABOVE AND ON THE ATTACHED SHEETS NUMBERED Nil HAVE BEEN EXAMINED IN ACCORDANCE WITH ESTABLISHED PROCEDURES AND FOUND TO COMPLY, TO THE BEST OF MY KNOWLEDGE AND BELIEF WITH THE PERTINENT COMPLIANCE REQUIREMENTS.			
I THEREFORE <input checked="" type="checkbox"/> RECOMMEND FOR APPROVAL OF THESE DATA <input type="checkbox"/> APPROVE THESE DATA			
 E. Burgoin, DAR 290M			

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

APPLICANT: AERO Design Ltd.
1045 McTavish Rd. N.E.
Calgary, Alberta, T2E 7G9

DATE: 12 March, 2002
REV. No. 3 4 June, 2002

CORRESPONDANCE TO:
(If other than applicant)

MAKE: Bell Helicopter
MODEL: 206B, 206L, 206L-1, 206L-3, 206L-4

REGISTRATION: All Applicable
SERIAL No.: All Applicable

NATURE OF WORK: Installation of Side-Mounted External Cargo Basket

MODEL CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.
MODIFICATION CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
Paragraph	Amdt.				
Subpart B – Flight					
27.27	24 Centre of Gravity Limits	N/A			No change from Type Approval.
27.29	24 Empty Weight and Corresponding C of G	Data specified on inst'n drawing			
27.51	24 Takeoff	Flight Test	X		Determine ROC at V _y . Determine ROD in autorotation.
27.65	24 Climb: All Engines Operating	Flight Test	X		
27.71	24 Gliding Performance	Flight Test	X		
27.75	24 Landing	Flight Test	X		
27.141	20 Flight Characteristics – General	Flight Test	X		
27.143	1 Controllability and Maneuverability	Flight Test	X		
27.151	24 Flight controls	Flight Test	X		
27.161	24 Trim	Flight Test	X		
27.171	24 Stability – General	Flight Test	X		
27.173	1 Longitudinal Stability	Flight Test	X		
27.175	1 Demonstration of Longitudinal Stability	Flight Test	X		
27.251	24 Vibration	Flight Test	X		

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
Paragraph	Amdt.				
Subpart C – Strength Requirements					
27.301	24	Loads – Air Drag Loads	Analysis	X	
27.301	24	Loads – Inertia Loads	Compliance with 27.337 and 27.561	X	
27.303	24	Factor of Safety	Analysis	X	
27.305	24	Strength and Deformation	Analysis and Test iaw AC 43.13-1A	X	
27.307	28	Proof of Structure	Analysis and Test iaw AC 43.13-1A	X	
27.337(a)	28	Limit Maneuvering Load Factor – Positive (3.5g)	Analysis and Test iaw AC 43.13-1A	X	Critical load factor in downward direction.
27.547	24	Main Rotor Structure	Flight Test	X	Proposed V_{NE} limitation. Asymmetric drag may impose bending load on mast.
27.561	24	Emergency Landing Conditions	Analysis and Test iaw AC 43.13-1A	X	
27.561(b)3(i)	24	Emergency Landing Conditions – Up (1.5g)	Analysis and Test iaw AC 43.13-1A	X	
27.561(b)3(ii)	24	Emergency Landing Conditions – Fwd (4.0g)	N/A		Forward deflection or failure of basket poses no threat to occupants.
27.561(b)3(iii)	24	Emergency Landing Conditions – Side (2.0g)	Analysis and Test iaw AC 43.13-1A	X	
27.561(b)3(iv)	24	Emergency Landing Conditions – Down (4.0g)	Compliance with 27.337	X	27.337 Maouvering Load is Critical.
Subpart D – Design and Construction					
27.601	24	Design	Drawings	X	Design is conventional.
27.603	24	Materials	Drawings	X	Materials used are specified in Mil-Hdbk-5H.
27.605	24	Fabrication Methods	Drawings	X	Design is conventional.
27.609	24	Protection of Structure	Drawings	X	
27.611	24	Inspection Provisions	Drawings	X	Design is easy to inspect.
27.613	28	Material Strength Properties and Design Values	Values used as per Mil-Hdbk-5H	X	
27.625	24	Fitting Factor	Analysis	X	
27.783	28	Doors	N/A		Installation does not block doors.
27.787(a)	24	Cargo and Baggage Compartments	Compliance with 23.301 through 307	X	
27.787(b)	24	Cargo and Baggage Compartments	Design	X	Basket is a closed container.
27.787(c), (d)	24	Cargo and Baggage Compartments	N/A		Cargo is external to helicopter.

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

Airworthiness Requirement	Subject for Compliance or Documentary Proof		Form of Substantiation	DOT	DAR	Comments
Paragraph	Amdt.					
27.807	28	Emergency Exits	N/A		X <i>AB</i>	Installation does not block doors.
27.865(a)	28	External Load Attaching Means	Compliance with 27.337		X <i>AK</i>	
27.865(b), (c)	28	External Load Attaching Means	N/A			
27.865(d)	28	External Load Attaching Means	N/A			Failure of an attachment does not endanger the rotorcraft.
27.1387	24	Position Light System Dihedral Angles	N/A			No change from Type Approval.
27.1401	24	Anticollision Light System	Statement	X		Light located at FS 396, WL 130 on vertical fin. Basket has no significant effect on visibility of anticollision light.
Subpart G – Operating Limitations and Information						
27.1505	24	Never Exceed Speed	Flight Test, Flight Manual Supplement (if req'd)	X		0.9 V_d that can be achieved in flight test with basket installed, if less than basic V_{ne} .
27.1525	24	Kinds of Operation	Flight Manual Supplement	X		Limited to VFR only.
27.1529	24	Instructions for Continuing Airworthiness	Maintenance Manual Supplement	X		
27.1557(a)	24	Miscellaneous Markings and Placards – Baggage Compartments	Placard		X <i>AB</i>	
27.1557(b)	24	Miscellaneous Markings and Placards	N/A			
27.1557(c)	24	Miscellaneous Markings and Placards	N/A			
27.1557(d)	24	Miscellaneous Markings and Placards	N/A			
27.1581	24	Rotorcraft Flight Manual – General	Flight Manual Supplement	X		
27.1583(c)	24	Operating Limitations – Weight and Loading Information	Flight Manual Supplement	X		
27.1585	1	Operating Procedures	Flight Manual Supplement	X		
27.1587	1	Performance Information	Flight Test, Flight Manual Supplement (if req'd)	X		Effect (if any) of basket installation on performance.
27.1589	24	Loading Information	Flight Manual Supplement & Placard	X		Placard installed on basket lid and beams.
Airworthiness Manual Requirements						
527.1581(e)		Rotorcraft Flight Manual – Units	SI and Imperial Units provided in Flight Manual Supplement	X		

AERO Design Ltd.
1045 McTavish Road NE
Calgary, AB, T2E 7G9
email: steve.aerodesign@telusplanet.net

FACSIMILE COVER PAGE

To: Mark Wiskemann	From: Steven Fahey
Fax #: 18074735485	Fax #: (403) 250-8333
Company: Wisk Air	Tel #: (403) 250-8027
Subject: FW: from Transport	
Sent: 6/19/02 at 4:20:46 PM	Pages: 6 (including cover)

MESSAGE:

Stamped approval documents that allow you to go flying with the external attach provisions still installed.

Steve



Transport Canada Transports Canada

Department of Transport

Limited Supplemental Type Certificate

This approval is issued to:

Aero Design Ltd.
1045 McTavish Road, N.E.
Calgary, ALBERTA
T2E 7G9 CANADA

Number: C-LSH02-135

Issue No.: 1

Approval Date: June 19, 2002

Issue Date: June 19, 2002

Responsible Office:

Prairie and Northern

Aircraft/Engine Type or Model:

BELL 206L

Registration/Serial No.:

C-FBHM/45066

Canadian Type Certificate or Equivalent:

H-92

Description of Type Design Change:

Installation of Landing Gear fittings with external load attachment provisions.

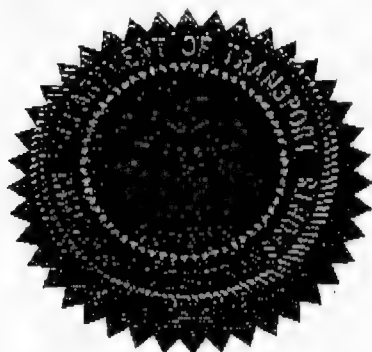
Installation/Operating Data,
Required Equipment and Limitations:

Installation of the landing gear fittings with external attachment provisions is to be done in accordance with Transport Canada approved Aero Design Ltd., Document Control List DCL 493, Rev 0, dated 19 June 2002, or later approved revision. (Any external load attachment requires additional approval).

Transport Canada approved Aero Design Ltd, Flight Manual Supplement, FMS493.01, Revision 0, dated 19 May 2002 is required.

The basis of certification is as defined by the applicable TCDS, plus FAR 27 amendment 27-24.

-- END --



Conditions: This approval is only applicable to the type/model of aeronautical product specified therein. Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated will not adversely affect the airworthiness of the modified product.

D.S. Austen
For Minister of Transport

Canada

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS		
49301	External Attachment Provisions Installation	0
FABRICATION DOCUMENTS		
49311	Forward Fitting	Revision 1
49312	Aft Fitting	Revision 1
49320	Barrel Nut	0
49319	Fabrication Drawing - Washer	Revision 0
ENGINEERING DOCUMENTS		
ER493.01	Engineering Report	0
FMS493.01	Flight Manual Supplement	0
<div style="display: flex; justify-content: space-between;"> <div style="width: 35%;"> <p>APPROVAL:</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <div style="display: inline-block; text-align: center;"> <small>Transport Canada</small> </div> <div style="display: inline-block; text-align: center;"> <small>Transports Canada</small> </div> </div> <p style="text-align: center; margin-top: 5px;">AIRCRAFT CERTIFICATION DIVISION</p> <p style="text-align: center; margin-top: 5px;">APPROVED</p> <p>By <u>D.S. Rusten</u></p> <p>App'l No. <u>C-LSH02-135</u></p> <p>App'l Date <u>2002/06/19</u></p> <p>Issue No. <u>1</u></p> <p>Issue Date <u>2002/06/19</u></p> <p style="text-align: right; font-size: small;">NY - 1007-010</p> </div> <div style="width: 35%;"> <p>ORIGINAL DATE: 19 June, 2002</p> <p>REVISION DATE:</p> </div> <div style="width: 30%; text-align: center;"> <p>AERO DESIGN LTD.</p> <p style="font-size: small;">1045 McTavish Rd. NE Calgary, Alberta T2E 7G9 Ph. (403) 250-8027 Fax. (403) 250-8333</p> </div> </div>		
SHEET 1 OF 1		<p>BELL 206L SERIES</p> <p>External Attachment Provisions</p>
DCL493		<p>Rev.</p> <p style="font-size: 2em;">0</p>

AERO DESIGN LTD.

FMS493.01

Approval Holder:
Aero Design Ltd.

BELL 206L SERIES



ROTORCRAFT FLIGHT MANUAL SUPPLEMENT for the INSTALLATION of EXTERNAL ATTACHMENT PROVISIONS

Supplemental Type Certificate No. SH00-48, Issue 2

Sections I, II, III and IV of this document comprise the Transport Canada Approved sections of this Flight Manual Supplement. Compliance with Section I, Limitations, is mandatory.

Section V and any subsequent sections if present are Unapproved and are provided for information only.

The information and data contained in this Flight Manual Supplement supersede or supplement that contained in the basic Approved Flight Manual for the Bell 206L Series when fitted with External Attachment Provisions. For limitations, procedures and performance not listed in this Flight Manual Supplement, refer to the Approved Flight Manual and other approved Flight Manual Supplements.

	Transport Canada	Transports Canada
AIRCRAFT CERTIFICATION DIVISION		
APPROVED		
By		
App'l No.	C-LSH02-135	
App'l Date	2002/06/19	
Issue No.	1	
Issue Date	2002/06/19	
YY - MM - DD		

Revision 0
19 May, 2002

TRANSPORT CANADA APPROVED

AERO DESIGN LTD.

FMS493.01

Table of Contents

I	Limitations	3
II	Normal Procedures	3
III	Emergency Procedures	3
IV	Performance	3

Revision 0
19 May, 2002

TRANSPORT CANADA APPROVED

AERO DESIGN LTD.

FMS493.01

I LIMITATIONS

1. Attachment of any equipment to the External Attachment Provisions must be approved by Transport Canada.

II NORMAL PROCEDURES

1. No change from basic Approved Flight Manual.

III EMERGENCY PROCEDURES

1. No change from basic Approved Flight Manual.

IV PERFORMANCE

1. No change from basic Approved Flight Manual.

Revision 0
19 May, 2002

TRANSPORT CANADA APPROVED

206L3

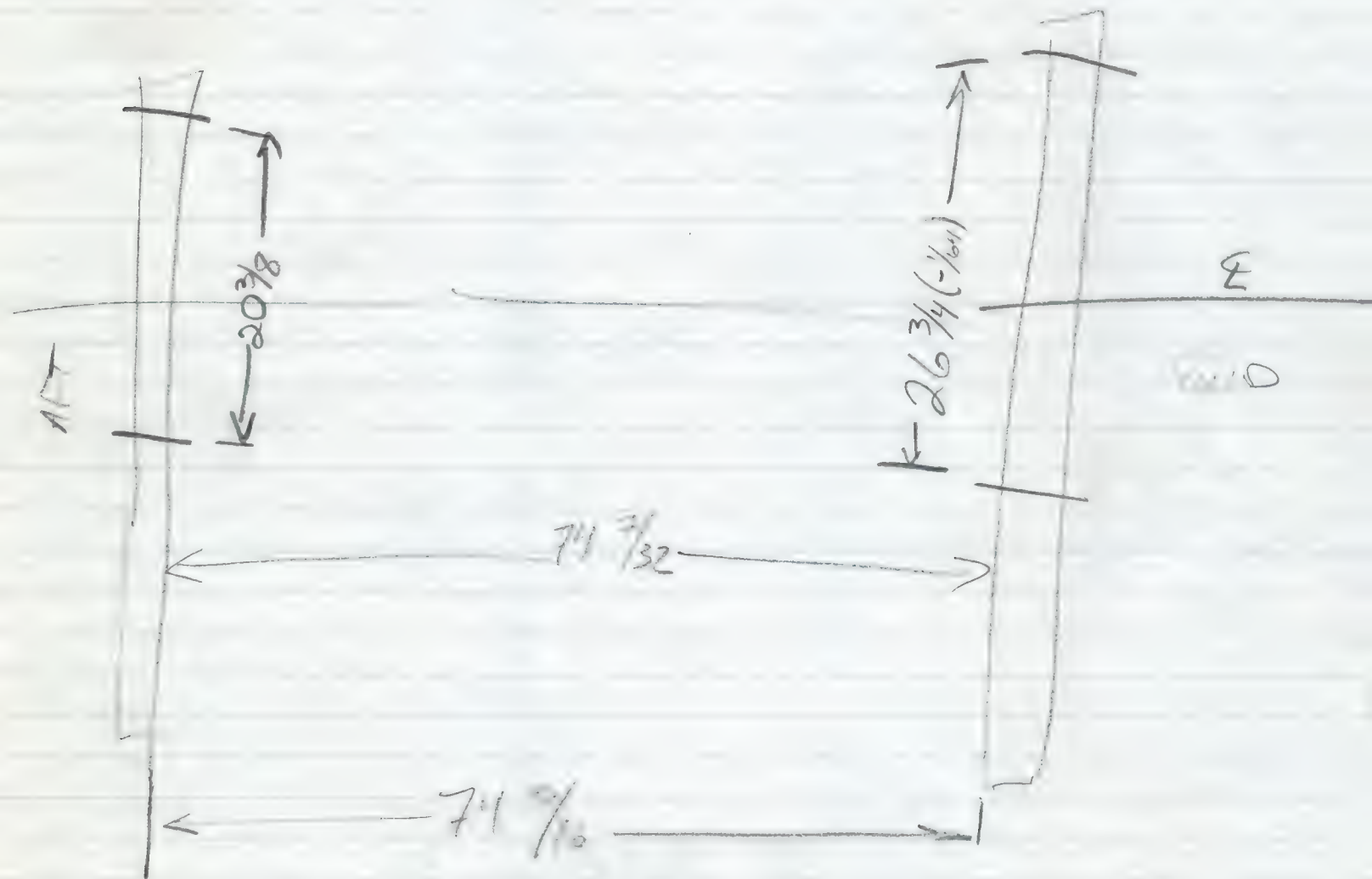
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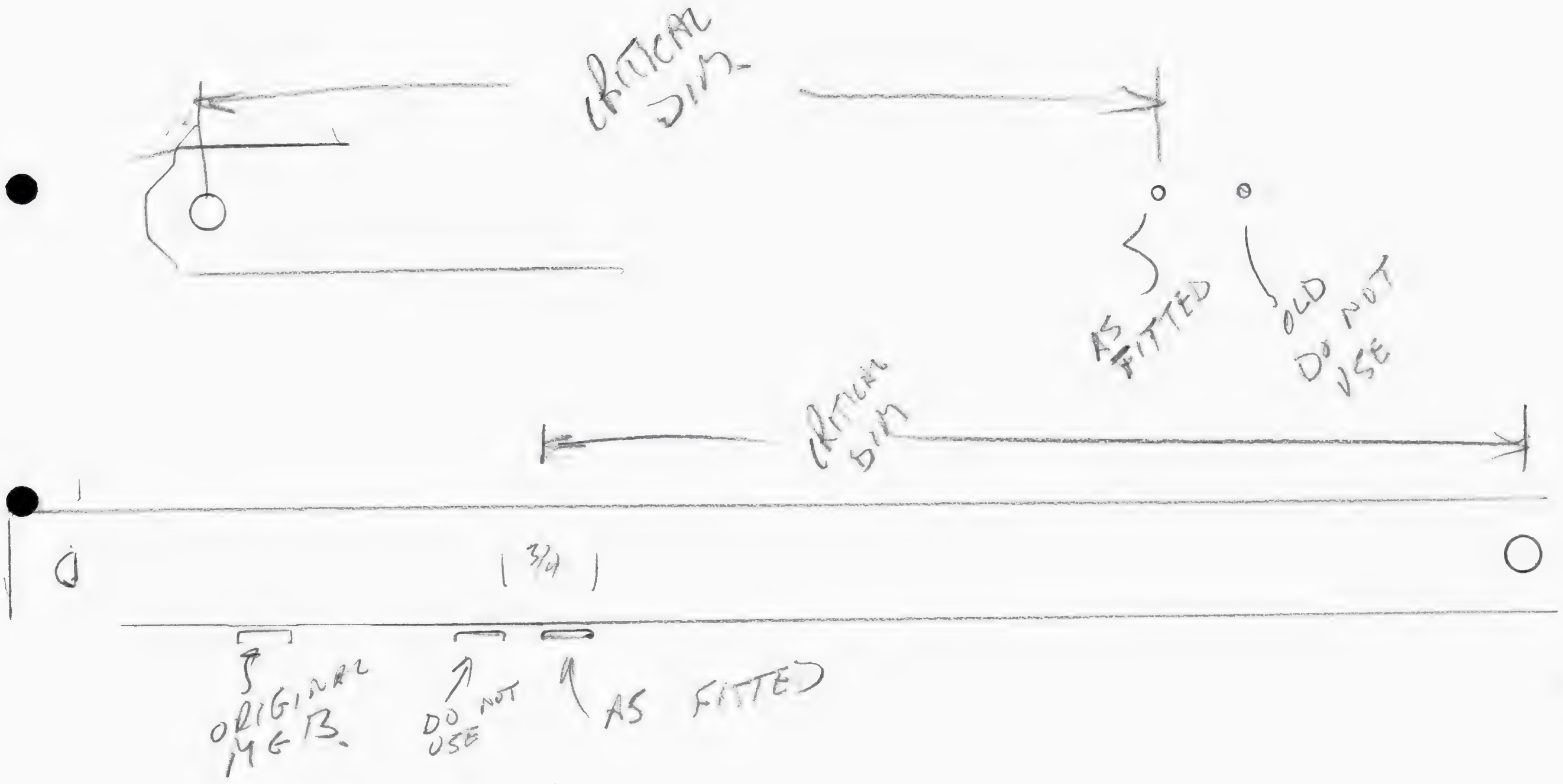
S/N 51014

~~24~~

HAS BELL HIGH SKID GEAR


P/N 206-323-017





MODIFICATION APPROVAL REQUEST APPLICATION FORM

MOD493A, Rev. 0

1. NAME AND ADDRESS OF APPLICANT: AERO Design Ltd. 1045 McTavish Rd. N.E. Calgary, AB, T2E 7G9		2. IDENTIFICATION OF PRODUCT					
		MAKE: BELL		MODEL: 206L			
ALL CORRESPONDANCE TO: AERO Design Ltd. 1045 McTavish Rd. N.E. Calgary, AB, T2E 7G9		SERIAL No.: 45066		REGISTRATION: C-FBHM			
3. REQUEST FOR:							
A. SUPPLEMENTAL TYPE CERTIFICATE (STC)		<input type="checkbox"/>					
B. STC/STA REVISION		<input type="checkbox"/> STC/STA No.					
C. LIMITED SUPPLEMENTAL TYPE CERTIFICATE (LSTC)		<input checked="" type="checkbox"/>					
D. LIMITED STC/STA REVISION		<input type="checkbox"/> LSTC/LSTA No.					
E. F.A.A. SUPPLEMENTAL TYPE CERTIFICATE		<input type="checkbox"/>					
F. F.A.A. STC REVISION		<input type="checkbox"/> STC No.					
G. FAMILIARIZATION OF F.A.A. STC		<input type="checkbox"/> STC No.					
H. REPAIR DESIGN APPROVAL (RDC)		<input type="checkbox"/>					
I. PARTS DESIGN APPROVAL (PDA)		<input type="checkbox"/>					
4. TITLE OF MODIFICATION OR REPAIR: External Attachment Provisions							
5. BRIEF DESCRIPTION OF MODIFICATION OR REPAIR: Provisions that replace all four of the landing gear fittings are installed on the helicopter. Performs same function as the original fittings from Bell, but each new fitting includes provision to install equipment using a 3/8" bolt.							
6. APPLICABLE TYPE APPROVAL (TA) OR TYPE CERTIFICATE (TC) DOCUMENTS:							
A. TA NO. <u>H-92</u> B. TC No. <u>H2SW</u> C. OTHER _____							
7. PROPOSED BASIS OF APPROVAL:							
A. SAME AS TA <input checked="" type="checkbox"/> B. SAME AS TC <input type="checkbox"/> C. OTHER <input type="checkbox"/> (Please specify) _____							
8. DOCUMENTATION CHECKLIST			REQUIRED		FOR DOT USE ONLY		
					RECEIVED		
			YES	NO	YES	NO	DATE
COMPLIANCE PROGRAM			X				
MASTER DRAWING LIST			X				
FLIGHT MANUAL SUPPLEMENT				X			
MAINTENANCE MANUAL SUPPLEMENT				X			
INSTRUCTIONS FOR CONTINUING AIRWORTHINESS				X			
ENGINEERING REPORTS			X				
DESIGN DRAWINGS				X			
MANUFACTURE DRAWINGS & INSTALLATION INSTRUCTIONS			X				
ELECTRICAL LOAD ANALYSIS				X			
DRAFT STC, LSTC OR RDA				X			
WEIGHT AND MOMENT CHANGE			X				
FLIGHT TEST DATA							
OTHER (Specify)							
9. APPLICANT'S REMARKS:							
10. In addition to the payment of Aircraft Certification approval fees as prescribed in Canadian Aviation Regulations (CAR) Section 104, I agree to reimburse Transport Canada incremental expenses as in Aviation Regulation Directive No. 3, or equivalent, as applicable. For further details governing cost recovery, refer to AMA 513/4.							
Aero Design Ltd.							
PER: 		Consultant		19 June, 2002			
SIGNATURE OF APPLICANTS		TITLE		DATE			
11.							
SIGNATURE OF REGIONAL ENGINEER				DATE			

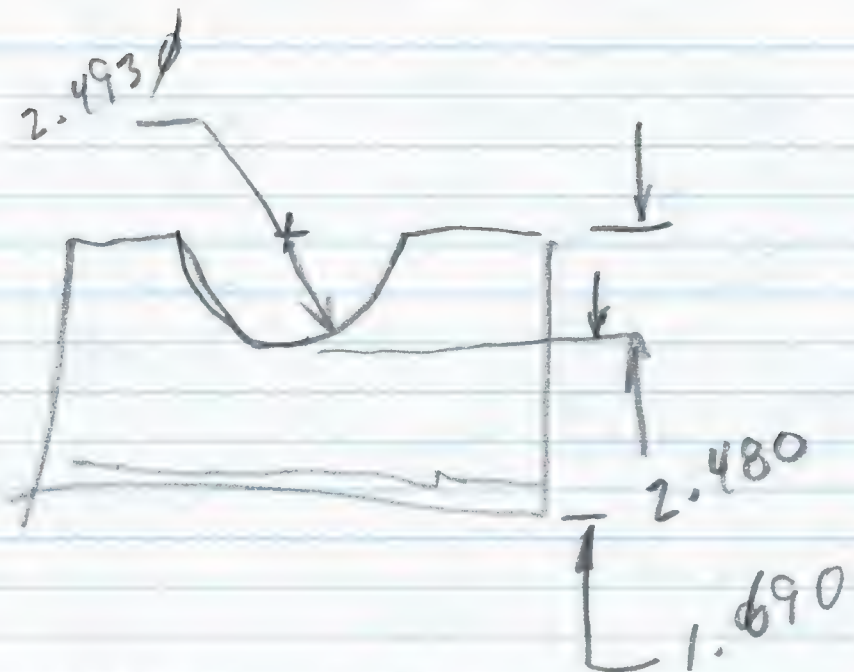
206 C3
N 752 HL
EAGLE

FRONT XTUBE
ATTACH FTG.

AS MEASURED

BELL PIN

206-033-108-001A



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 \cancel{.620} \\
 \hline
 1.234
 \end{array}$$

AERO DESIGN LTD.

1045 McTavish Rd. N. E., Calgary, Alberta, T2E 7G9

aerodesign@telusplanet.net

F A X C O V E R S H E E T**DATE:** June 19, 2002**TIME:** 10:40 AM**TO:** Jack Staal**PHONE:** 780-495-5227**FAX:** 780-495-7963**FROM:** S. Fahey
Aero Design Ltd.**PHONE:** 403-250-8027**FAX:** 403-250-8333

Number of pages including cover sheet: 7

RE: ISSUE OF APPROVAL OF EXTERNAL ATTACH PROV.

Ted has signed off on the items in his delegation for the External Attachment Provisions. The Compliance Program covers only what's required for the Provisions. A separate issue of the STC for the basket's installation can come later.

Compliance Program	CP493	Rev. 2
AE100	AE493.01	Rev. 0
AE100	AE493.02	Rev. 0
Draft STC	SH00-48	Issue 2

You should already have copies of the DCL, report, and drawings.

Please approve this configuration of the installation and we shall worry about the rest later.

Steve

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

APPLICANT: AERO Design Ltd.
1045 McTavish Rd. N.E.
Calgary, Alberta, T2E 7G9

DATE: 12 March, 2002
REV. No. 2 19 June, 2002

CORRESPONDANCE TO:
(If other than applicant)

MAKE: Bell Helicopter
MODEL: 206B, 206L, 206L-1, 206L-3, 206L-4

REGISTRATION: All Applicable
SERIAL No.: All Applicable

NATURE OF WORK: Installation of External Attachment Provisions

MODEL CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.

MODIFICATION CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
Paragraph	Amdt.				
Subpart B – Flight					
27.29	24 Empty Weight and Corresponding C of G	Data specified on inst'n drawing		X	pb
Subpart C – Strength Requirements					
27.301	24 Loads	Compliance with 23.471, 23.473, 23.337 and 23.561		X	pb
27.303	24 Factor of Safety	Analysis		X	pb
27.305	24 Strength and Deformation	Analysis		X	pb
27.307	28 Proof of Structure	Analysis		X	pb a) Original load path unaffected, as shown by comparison of material strengths. b) Provision load path analyzed to establish design allowable loads.
27.337	28 Limit Maneuvering Load Factor	Analysis		X	pb Limit maneuvering load factor to be applied in analysis to demonstrate vertical capacity of external attachment

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
27.471	24 Ground Loads – General	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.473	24 Ground loading conditions and assumptions	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
Paragraph	Amdt.				
27.501	28 Ground Loading Conditions – Landing Gear with Skids	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.561	24 Emergency Landing Conditions	Analysis		X	Ultimate manoeuvring load factor exceeds downward emergency landing load factor.
27.571	28 Fatigue Evaluation of Flight Structure	Analysis	X		Provision fastener joint only.
Subpart D – Design and Construction					
27.601	24 Design	Drawings		X	Design is conventional.
27.603	24 Materials	Drawings		X	Materials used are specified in Mil-Hdbk-5H.
27.605	24 Fabrication Methods	Drawings		X	Design is conventional.
27.609	24 Protection of Structure	Drawings		X	
27.611	24 Inspection Provisions	Drawings		X	Design is easy to inspect.
27.613	28 Material Strength Properties and Design Values	Values used as per Mil-Hdbk-5H		X	
27.625	24 Fitting Factor	Analysis		X	
27.725	24 Limit Drop Test	N/A			Ref. TCDS Equivalent Safety Finding for L-4. Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.727	28 Reserve Energy Absorption Drop Test	N/A			Ref. TCDS Equivalent Safety Finding for L-4. Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.865	28 External Load Attaching Means	N/A			Provision only: Consideration required for approval of equipment attached to provision.



Department of Transport

Supplemental Type Certificate

DRAFT

This approval issued to:

AERO Design Ltd.
1045 McTavish Road NE
Calgary, Alberta
T2E 7G9

Approval Number: SH00-48

Issue No.: 2

Date of Approval: 8 December, 2000

Date of Issue: 19 June, 2002

Responsible Office: Prairie and Northern

Aircraft / Engine Type: Bell Helicopter

Model: 206L, 206L-1, 206L-3, 206L-4, 407

Canadian Type Certificate or Equivalent: H-92, H2SW

Description of Design Change: External Attachment Provisions

Required Equipment and Limitations: Bell 407 only:

Installation of Aero Design Ltd. starboard cargo basket is to be done in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL362, Rev. 2, dated 23 November 2000, or later approved revision.

Transport Canada approved AERO Design Ltd. Flight Manual Supplement FMS362.01, Revision 1, dated 14 November 2000 is required with this installation.

AERO Design Ltd. Maintenance Manual Supplement MMS362.01, Revision 0, dated 15 November 2000 is required with this installation.

Applicable placard required on the basket lid in accordance with installation drawing 36201.

Conditions: This approval is only applicable to the type/model of aeronautical product specified therein. Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated will not adversely affect the airworthiness of the modified product.

F.J.B. Wright

For the Minister of Transport

Continuation Sheet

DRAFT

Approval Number: SH00-48

Issue Number: 2

Approval Data (Continued):

NOTE: THIS ADDENDUM SHALL REMAIN PART OF THE CERTIFICATE REFERRED TO THEREIN.

Required Equipment and Limitations (continued):

Bell 206L, 206L-1, 206L-3, and 206L-4 only:

Configuration "A", External Attachment Provisions only:

Installation of External Attachment Provisions to be completed in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL493, Rev. 0, or later approved revision.

FORM AE-100

DEPARTMENT OF TRANSPORT STATEMENT OF COMPLIANCE OF AIRCRAFT OR AIRCRAFT COMPONENTS WITH THE AIRWORTHINESS REQUIREMENTS		AE-100 No.: AE493.01 Initial Issue Date: 19 June, 2002 Revision: 0 Revision Date: Approval No.: SH00-48, Issue 2 Delegation No.: 290M Delegate Name: E. Burgoin Classification of Designee: Employer: AERO Design Ltd.
Aircraft Mfr: Bell Aircraft Model: 206L Series Registration:	Model Type Airplane <input type="checkbox"/> Helicopter <input checked="" type="checkbox"/> Appliance <input type="checkbox"/> Component <input type="checkbox"/>	

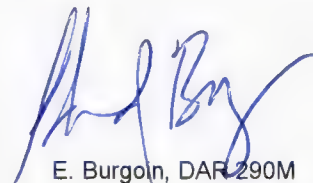
LIST OF APPROVED REPORTS AND DATA

Document Number	Document Title	Compliance Status
DCL493	Revision 1	Document Control List and all documents referred to therein
ER493.01	Revision 0	Engineering Report
49301	Revision 0	Installation Drawing
49311	Revision 1	Fabrication Drawing – Forward Fitting
49312	Revision 1	Fabrication Drawing – Aft Fitting
49320	Revision 0	Fabrication Drawing – Barrel Nut
49319	Revision 0	Fabrication Drawing – Washer
CP493	Revision 2	All Requirements except: 27.471, 27.473, 27.501, 27.571
DATA APPROVED BY TRANSPORT CANADA		
	SEE AE493.02	

CERTIFICATION

UNDER THE AUTHORITY VESTED IN ME BY THE DEPARTMENT OF TRANSPORT, I HERBY CERTIFY THAT THE DATA LISTED ABOVE AND ON THE ATTACHED SHEETS NUMBERED Nil HAVE BEEN EXAMINED IN ACCORDANCE WITH ESTABLISHED PROCEDURES AND FOUND TO COMPLY, TO THE BEST OF MY KNOWLEDGE AND BELIEF WITH THE PERTINENT COMPLIANCE REQUIREMENTS.

I THEREFORE ☐ RECOMMEND FOR APPROVAL OF THESE DATA
☒ APPROVE THESE DATA


 E. Burgoin, DAR 290M

FORM AE-100

DEPARTMENT OF TRANSPORT STATEMENT OF COMPLIANCE OF AIRCRAFT OR AIRCRAFT COMPONENTS WITH THE AIRWORTHINESS REQUIREMENTS		AE-100 No.: AE493.02 Initial Issue Date: 19 June, 2002 Revision: 0 Revision Date: Approval No.: SH00-48, Issue 2 Delegation No.: 290M Delegate Name: E. Burgoin Classification of Designee: Employer: AERO Design Ltd.
Aircraft Mfr: Bell Aircraft Model: 206L Series Registration:	Model Type Airplane <input type="checkbox"/> Helicopter <input checked="" type="checkbox"/> Appliance <input type="checkbox"/> Component <input type="checkbox"/>	

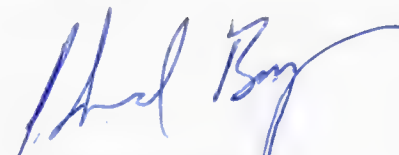
LIST OF APPROVED REPORTS AND DATA

Document Number		Document Title	Compliance Status
DCL493	Revision 1	Document Control List and all documents referred to therein	
ER493.01	Revision 0	Engineering Report	
49301	Revision 0	Installation Drawing	
49311	Revision 0	Fabrication Drawing – Forward Fitting	
49312	Revision 0	Fabrication Drawing – Aft Fitting	
49320	Revision 0	Fabrication Drawing – Barrel Nut	
49319	Revision 0	Fabrication Drawing – Washer	
CP493	Revision 2	Requirements: 27.471, 27.473, 27.501, 27.571 only	
DATA APPROVED BY TRANSPORT CANADA			
		As Above	

CERTIFICATION

UNDER THE AUTHORITY VESTED IN ME BY THE DEPARTMENT OF TRANSPORT, I HERBY CERTIFY THAT THE DATA LISTED ABOVE AND ON THE ATTACHED SHEETS NUMBERED Nil HAVE BEEN EXAMINED IN ACCORDANCE WITH ESTABLISHED PROCEDURES AND FOUND TO COMPLY, TO THE BEST OF MY KNOWLEDGE AND BELIEF WITH THE PERTINENT COMPLIANCE REQUIREMENTS.

I THEREFORE ☒ RECOMMEND FOR APPROVAL OF THESE DATA
☐ APPROVE THESE DATA


 E. Burgoin, DAR 290M

WISK-AIR

807-473-5485

18 JUNE 2002

9:50

MARK,

OUR MEASUREMENTS SAY THIS IS WHAT YOU NEED.

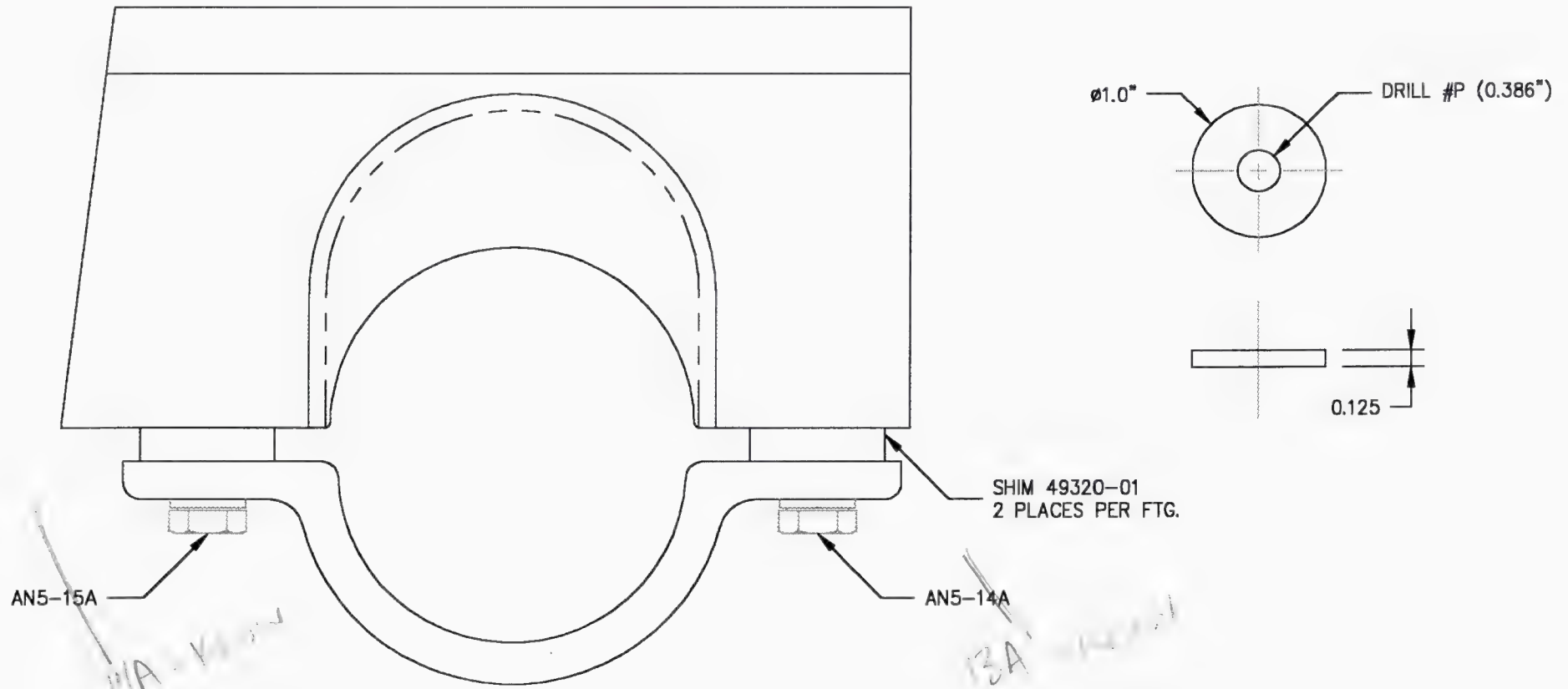
STEVE

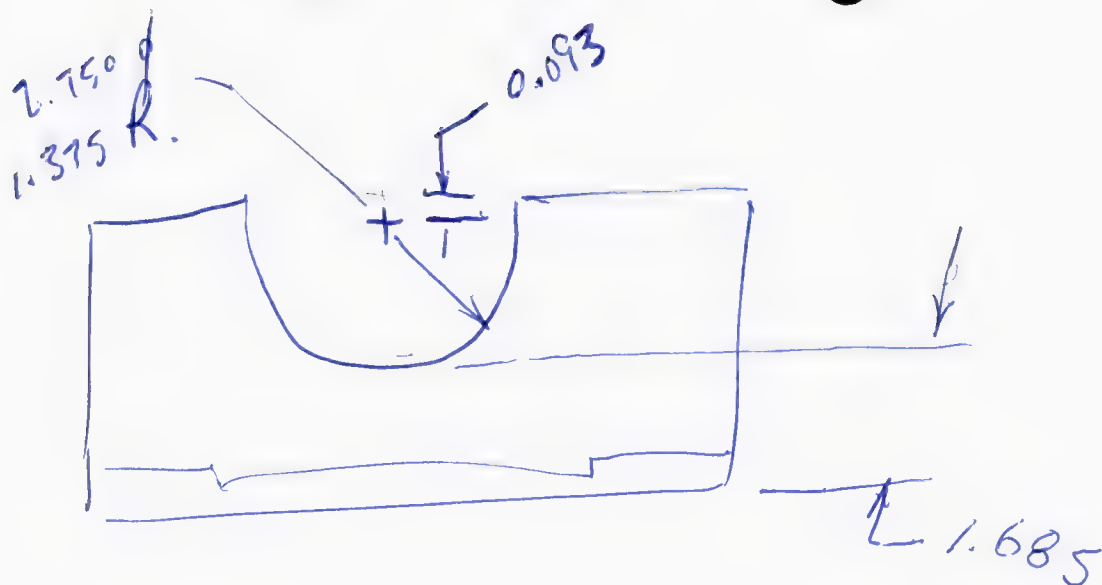
AERO DESIGN

PH 403 250 8027

SAX

8333





Ball Fitting

June 17/02
XSTEEL PROBLEMS
@ WICKAIR

MEASURED FROM FITTING
REMOVED FROM N753H L
AT EAGLE 206 L-3

TED.

AERO Design Ltd.
1045 McTavish Road NE
Calgary, AB, T2E 7G9
email: steve.aerodesign@telusplanet.net

FACSIMILE COVER PAGE

To: Mark	From: Steven Fahey
Fax #: 18074735485	Fax #: (403) 250-8333
Company: Wisk Air	Tel #: (403) 250-8027
Subject: Service Bulletin	
Sent: 6/16/02 at 8:28:14 PM	Pages: 4 (including cover)

MESSAGE:

This should get you going for Monday.

Aero Design Ltd.

SERVICE BULLETIN

SB49221.01

**BELL 206L SERIES HELICOPTER
SIDE-MOUNTED CARGO BASKET**

ATTACHMENT HOLES IN FORWARD SUPPORT BEAM

Revision 0

16 June, 2002

AERO Design Ltd.
Engineering Consultants

1045 M^cTavish Road N.E., Calgary, Alberta T2E 7G9

Phone: (403) 250-8027

Fax: (403) 250-8333

E-Mail: aerodesign@telusplanet.net

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1.0 BACKGROUND

Difficulty in mounting cargo baskets has arisen due to the ambiguity of spacing of forward landing gear fittings on the fuselage of Bell 206L helicopters. The Maintenance Manual of the Bell 206L states that the fittings are spaced 26.46" apart, while other published material shows 26.60". Measurements from some helicopters show that the spacing is 26.72" apart. The spacing of the 3/8" holes in the forward mounting beam may be adjusted to accommodate this variability.

2.0 MATERIAL

Round File	1
Emery Paper	A/R
Epoxy Primer	A/R

3.0 INSTRUCTIONS

Where the spacing of the 3/8" holes on the Forward Support Beam (p/n 49221-01) do not fit the spacing of the 3/8" holes on the External Attachment Provisions:

1. File hole shown in Figure 3.1 into a slot. Increase distance between bolt centers by 1/8" or until fit with External Attachment Provisions is attained. Where facilities exist, the Forward Support Beam may be mounted in a Vertical Milling Machine to widen the hole. (Actual diameter of hole is $\varnothing 0.386$ ", drill #W).

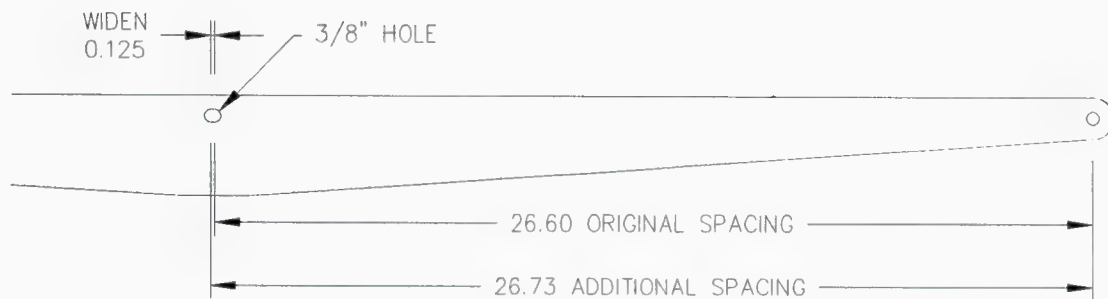


Figure 3.1 Widening 3/8" Hole

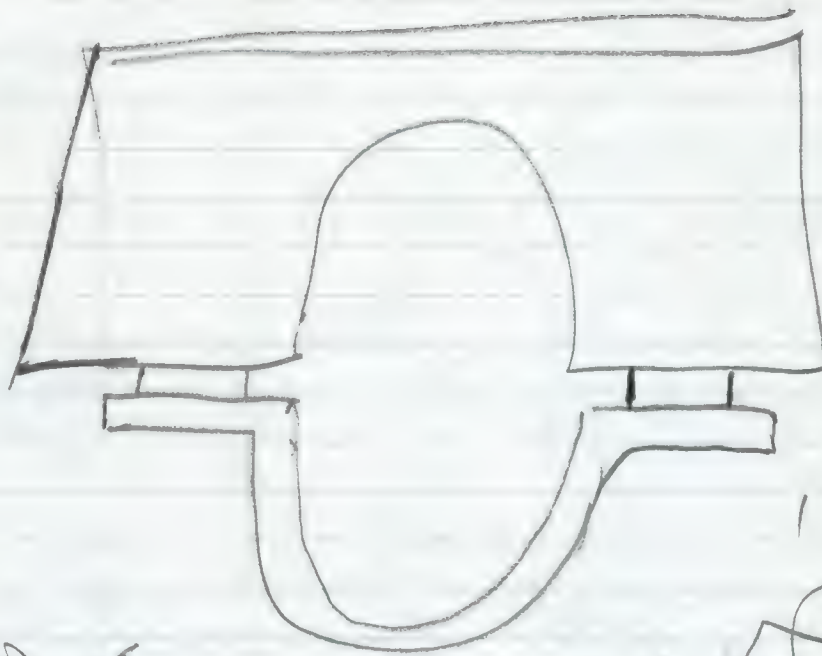
2. Deburr edges and clean inside hole with emery paper. Polish in circumferential direction.
3. Touch-up paint inside and around expanded hole with epoxy primer.

AFT
FTTG ONLY

SB 49312-01

SERVICE
BULLETIN

CHANGE NOTICE



DRILL P.

GIVE
NO
DIM

"A" ADD SPACER BOTH SIDES

PART NO. 492 ??

"B"

IN LIEU OF SPACER, AN 960-516
WASHERS MAY BE USED

(30400 Reg'd)

SOME 206 / 206 L AFT CROSS TUBE ATTACH
FITTINGS REQUIRE SPACER BETWEEN FITTING
AND CLAMP.

AERO DESIGN LTD.

1045 McTavish Rd. N. E., Calgary, Alberta, T2E 7G9

aerodesign@telusplanet.net

F A X C O V E R S H E E T

DATE: June 13, 2002

TIME: 12:40 PM

TO: Dan Maunula

PHONE: 807-474-2573

Transport Canada/Thunder Bay

FAX: 807-475-5816

FROM: S. Fahey
Aero Design Ltd.

PHONE: 403-250-8027

FAX: 403-250-8333

Number of pages including cover sheet: 3

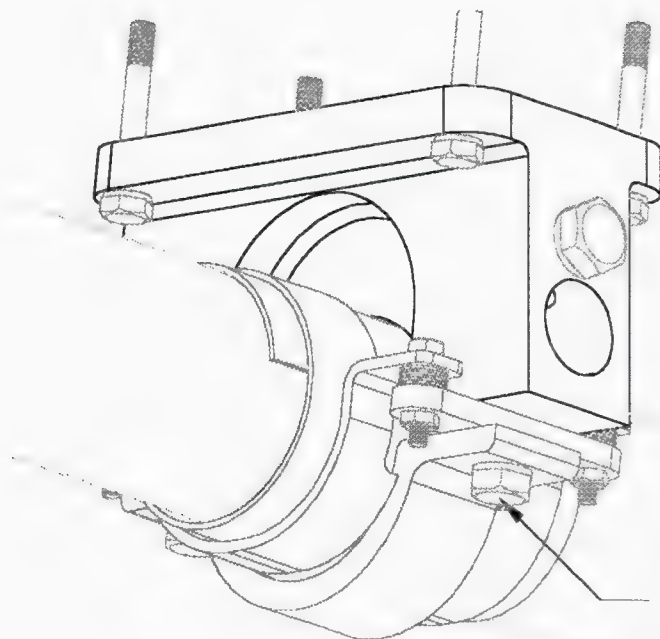
RE: INSPECTION OF CARGO BASKET

I have two drawings to add to the package of documents that you need for your conformity inspection. Availability of some tooling made it necessary to add a washer into the hardware that clamps the cross-tubes to the fittings. The semi-circular washer is shown in drawing 49319, and a Drawing Change Notice is included with it to be attached to the installation drawing, 49301.

Steve

CHANGES

1. WHERE BOTTOM OF FITTING 49312-01 IS SPOTFACED INTERNALLY, USE ORIGINAL HARDWARE TO MOUNT LANDING GEAR CROSS-TUBE.
WHERE THE FITTING IS NOT SPOTFACED INTERNALLY, USE SEMI-CIRCULAR WASHER (49319-01) UNDER NUT.



USE EXISTING HARDWARE
AND SEMI-CIRCULAR WASHER
P/N 49319-01 AS REQUIRED
TYPICAL 1 PLACE PER FITTING

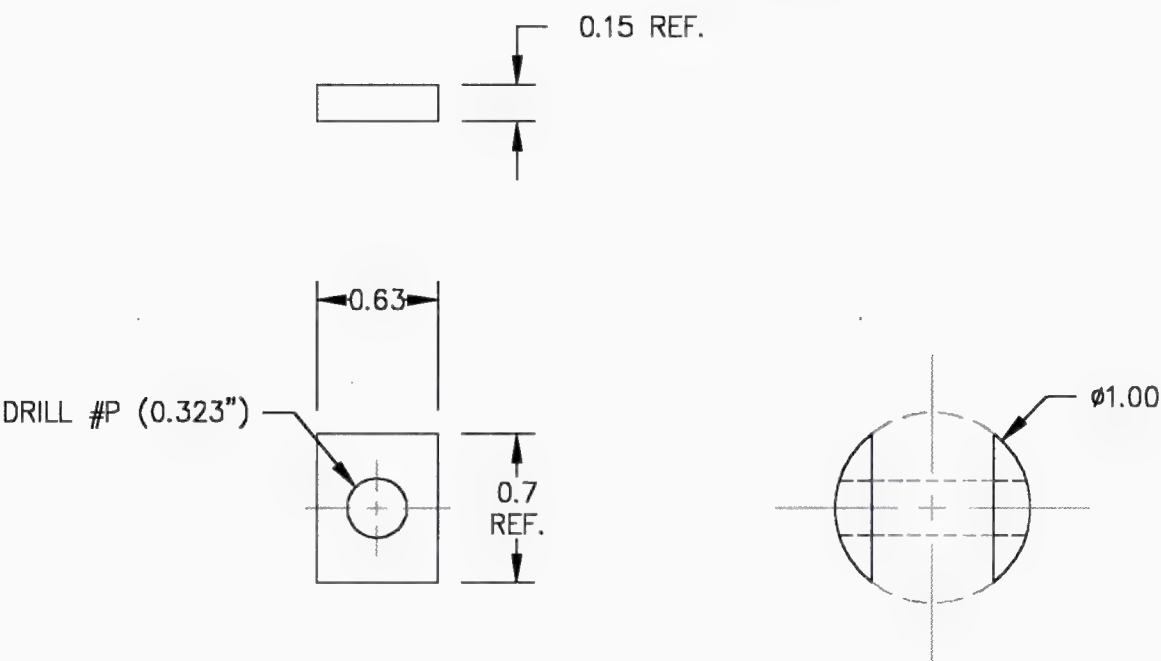
03 AFT FITTING

AN6 BOLT ORIENTED FORWARD

TYPICAL LEFT AND RIGHT

APPROVALS		DATE		AERO DESIGN LTD. ENGINEERING CONSULTANTS 1046 McTAVISH ROAD N.E. CALGARY, ALBERTA T2E 7G9				
DRAWN: STEVEN FAHEY		JUN 06/02						
CHECKED: E. BURGOIN		JUN 06/02						
STRESS:				DRAWING CHANGE NOTICE The changes indicated are applicable to the initial issue and/or to previous Drawing Change Notices for this drawing and supercede the information from the initial issue of the drawing and/or any earlier Drawing Change Notices. This Drawing Change Notice must accompany the drawing it applies to at all times.				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON:								
DECIMALS		ANGLES						
X.XXX ±0.010		±1/2"						
X.XX ±0.03								
X.X ±0.1								
SCALE 1 : 1				DWG. SIZE	DWG. NO.		REV.	CHG.
SHEET 1 OF 1				A4	49301		0	A

LIST OF MATERIALS					
PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
49319-01	01	SEMI-CIRCULAR WASHER	6061 ALUMINUM		Ø1.00" BAR



01 SEMI-CIRCULAR WASHER
(MAKES TWO)

NOTES:
1. REMOVE ALL BURRS AND SHARP EDGES.

APPROVALS	DATE
DRAWN: STEVEN FAHEY	JUN 06/02
CHECKED: E. BURGOIN	JUN 06/02
STRESS:	

AERO DESIGN LTD.
ENGINEERING CONSULTANTS
1045 McTAVISH ROAD N.E.
CALGARY, ALBERTA T2E 7G9

1			
REV.	DESCRIPTION OF CHANGE	INITIALS	DATE

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON:	
DECIMALS	ANGLES
X.XXX ±0.010	±1/2°
X.XX ±0.03	
X.X ±0.1	

SEMI-CIRCULAR WASHER
FABRICATION

SCALE 1 : 1
SHEET 1 OF 1

DWG. SIZE
LGL

DWG. NO.
49319

REV.
0

AERO Design Ltd.
1045 McTavish Road NE
Calgary, AB, T2E 7G9
email: steve.aerodesign@telusplanet.net

FACSIMILE COVER PAGE

To: Jack Staal

Fax #: 17804957963

Company: Transport Canada

From: Steven Fahey

Fax #: (403) 250-8333

Tel #: (403) 250-8027

Subject: Bell 206 Belly panel load test, report 261.02

Sent: 6/10/02 at 11:59:54 AM

Pages: 8 (including cover)

MESSAGE:

I can send the whole report thru the fax because it isn't long. Page numbers and photos may be garbled through the fax software, so if you want a clean copy, we'll just mail you one later.

stf

AERO Design Ltd.

ENGINEERING REPORT

ER493.03

BELL 206L SERIES

EXTERNAL ATTACHMENT FITTINGS

FITTING FLANGE LOAD TEST

Revision 0

05 June, 2002

AERO Design Ltd.

Engineering Consultants

Transport Canada Approvals

1045 McTavish Road N.E., Calgary, Alberta T2E 7G9

Phone: (403) 250-8027

Fax: (403) 250-8333

E-Mail: aerodesign@telusplanet.net

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LOG OF REVISIONS

REV	DATE	DESCRIPTION	PAGES AFFECTED	INITIALS
0	JUN 05/02	Original Release	All	STF

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3.0 BASIS OF CERTIFICATION	5
4.0 APPLICABILITY OF AIRWORTHINESS DIRECTIVES	5
5.0 LOADS	6
6.0 TEST ARTICLE	6
7.0 TEST SETUP.....	8
8.0 TEST RESULTS	9

1.0 INTRODUCTION

The interchangeability of the Bell Fittings and the Aero Design Ltd. external attachment fittings is by the need for thickened upper flanges, which was shown to be necessary in Engineering Report ER493.01. The analysis in ER493.01 compared material strengths instead of using ultimate loads, and consequently showed that the upper flanges needed to be thickened by about 60%. This can be seen in the sketch below.

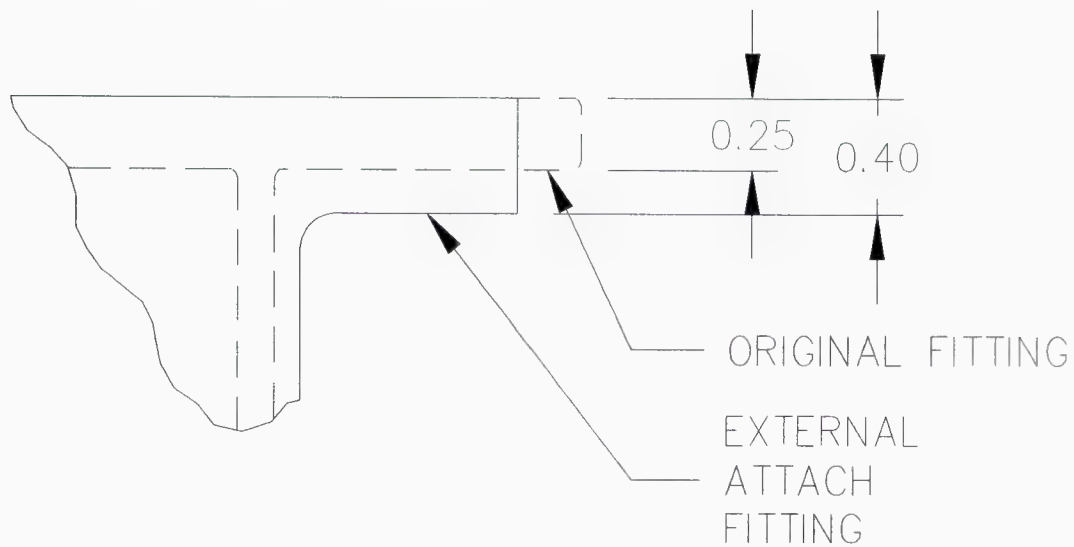


Figure 1.1 Changed Geometry of Forward Fitting Flanges (Aft Ftg Similar)

An ultimate load test has been performed that demonstrates that the original thickness of the flange is satisfactory in the Aero Design Ltd. External Attachment Provision Fittings.

2.0 REFERENCE

Aero Design Ltd. Drawings 49311 and 49312

Aero Design Ltd. Engineering Report ER493.01

3.0 BASIS OF CERTIFICATION

To be applicable to all models of the 206L series, the certification basis of the 206L-4 is used:

Bell 206L-4

Canadian Type Approval H-92

FAA Type Certificate

H2SW

FAR Part 27 dated 2 October 1964 Amendment 27-1 through 27-24 with:
27.79, 27.143, 27.173, 27.175, 27.1519, 27.1585, 27.1587 at Amdt 27-1;
27.1093, 27.1545 at Amdt 27-8;
27.45, 27.141, 27.1309 at Amdt 27-20;
27.2, 27.307, 27.337, 27.351, 27.427, 27.501, 27.571, 27.613, 27.629, 27.663,
27.674, 27.685, 27.727, 27.783, 27.807, 27.861, 27.865 at Amdt 27-28;
and 27.391, 27.395, 27.397, 27.681, 27.1357, 27.1361, replaced by 6.220,
6.225, 6.323, 6.623, 6.624, 6.625, 6.626 of CAR Part 6 dated 6 December 1956
Amendment 6-1 through 6-4.

Exceptions to FAR 27 are the deletion of: 27.71, 27.177, 27.399, 27.562, 27.610,
27.954, 27.1195, 27.1322.

Equivalent Safety Findings:

1. Skid Landing Gear (Drop Test) FAR 27.723, 27.725, and 27.727
2. Fuel Tanks (Drop Test)- FAR 27.965(c)(1) and (c)(2). FAR Part 36 dated 3
November 1969 Amendment 36-1 through 36-14, Subpart H.

4.0 APPLICABILITY OF AIRWORTHINESS DIRECTIVES

Airworthiness Directives applicable to the Bell 206L series have been reviewed and no conflicting AD's were found.

5.0 LOADS

The ultimate allowable vertical load that may be placed on the AN6 bolt in the External Attachment Provision is 3413 pounds, which is shown in Engineering Report ER493.01, Section 10.2. The report goes on to demonstrate that due to assymetry of the connection, the ultimate vertical load applies 2113 pounds to each AN4 bolt that fastens the fitting to the fuselage (Section 12.6).

The test piece was made with a flange on each side, so that it could be bolted symmetrically. To apply 2113 pounds to each AN4 bolt, 4226 pounds tensile load must be applied to the fitting.

6.0 TEST ARTICLE

A test piece was fabricated with the same cross-sectional dimensions as the External Attachment Fittings, with the exception that the upper flange was made only 0.250" thick. The material used for the test piece is 6061-T651 aluminum plate; from the same piece, in fact, that the first set of fittings were made. The material grain orientation was also identical. Figure 6.1 shows the dimensions of the test article. It is 1.25" thick.

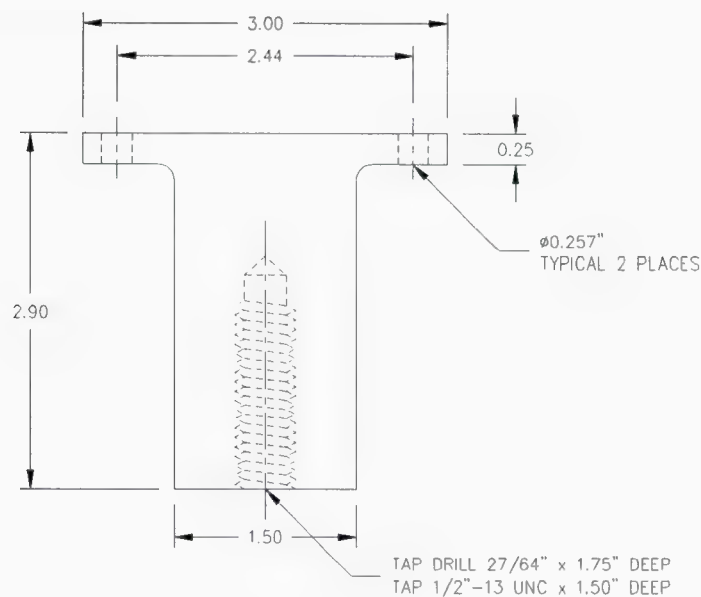


Figure 6.1 Dimensions of Test Article

The test article was bolted to a 1.0" square bar using AN4-14 bolts and MS21044N4 nuts. The bottom was blind tapped $\frac{1}{2}$ "-13 UNC and attached to a forged eye fitting with $\frac{1}{2}$ " threaded rod. This assembly is shown in Figure 6.2.

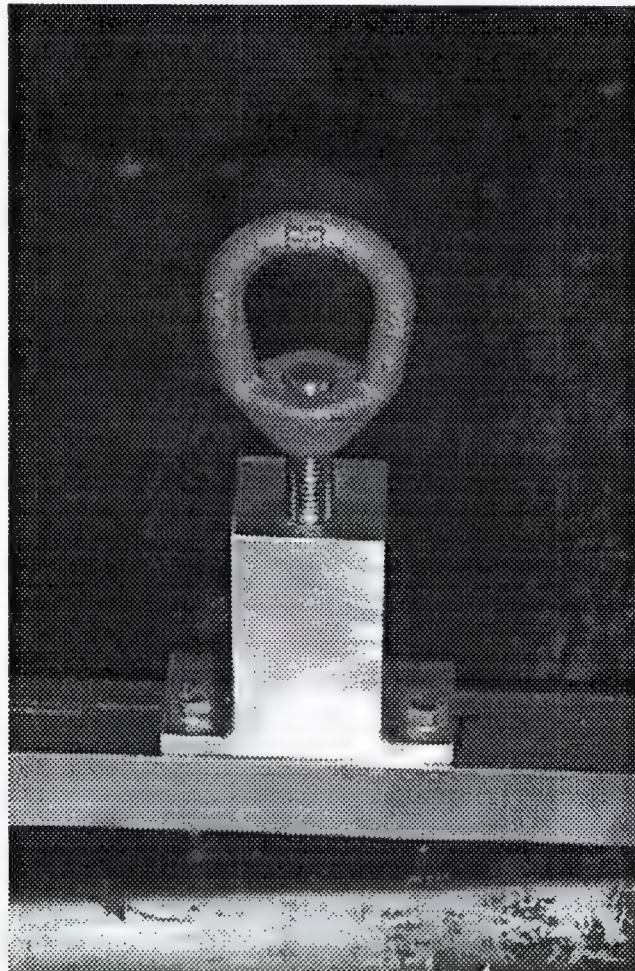


Figure 6.2 Assembly of Test Piece

7.0 TEST SETUP

The test article assembly was mounted into the press frame as shown in Figure 7.1. The load cell and come-along were hooked up in series to apply the test load. The 1" square bar beared upward on the bottom of the press table as the come-along pulled up on the fitting. Wood blocks were inserted between the 1" square bar and the press table to increase the number of cranks on the come-along (to better control the applied load).

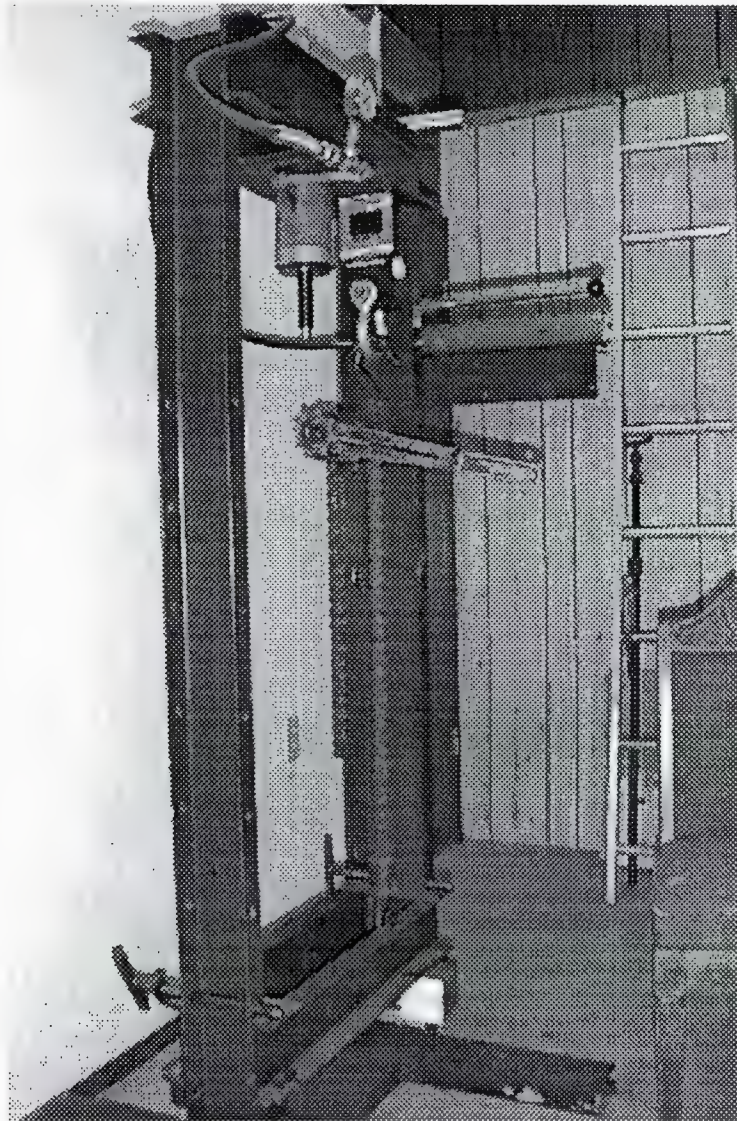


Figure 7.1 Test Apparatus

8.0 TEST RESULTS

The come-along was cranked until it applied 4460 pounds tensile load to the fitting, as shown in Figure 8.1.

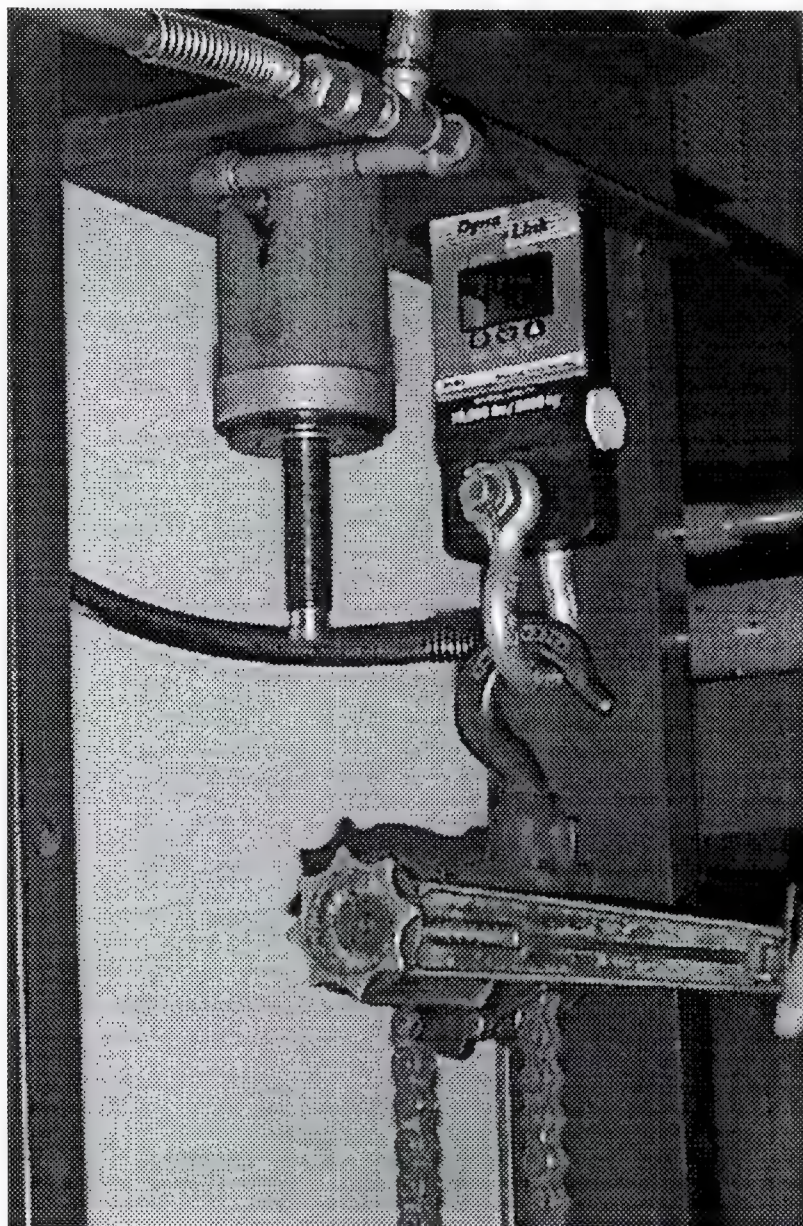


Figure 8.1 4460 Pounds Applied to fitting.

When the fitting assembly was removed from the frame, it was examined for signs of deformation or failure. No signs of either were evident, as can be seen in Figure 8.2.

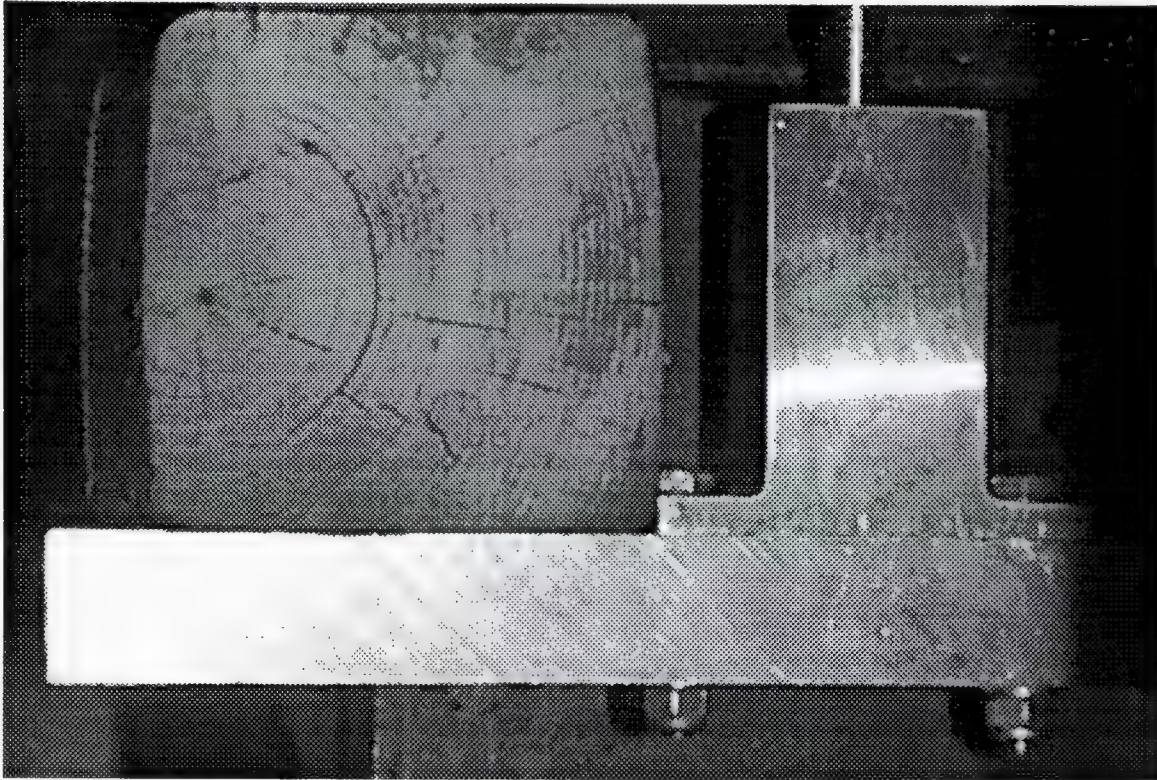


Figure 8.2 No Deflection of Flanges Under 4460 Pounds Load

This test demonstrates that under a vertical load of 4460 pounds, each flange can withstand 2230 pounds without damage or permanent deformation, when they are 0.250" thick. Only 2113 pounds will be applied to the flanges under the ultimate vertical load condition on the fitting.

Drawings 49311 and 49312 have been revised in order to reduce the thickness of the upper flange to that of the original Bell parts.

Margin of Safety = Positive

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

F A X C O V E R S H E E T

DATE:	May 21, 2002	TIME:	8:32 AM
TO:	Mr. Jack Staal	PHONE:	780-495-5227
	Tranport Canada	FAX:	780-495-7963
FROM:	E. Burgoin	PHONE:	403-250-8027
	Aero Design Ltd.	FAX:	403-250-8333

Number of pages including cover sheet: 1

RE: SUBMISSION OF DATA: BELL 206L CARGO BASKET

Jack,

I put a package on the Greyhound courier yesterday, that should arrive at your office early this morning, containing the following:

Document Control List	DCL493	Rev. 0
Flight Manual Supplement	FMS493.01	Rev. 0
Installation Drawing	49301	Rev. 0
Fabrication Drawing	49311	Rev. 0
Fabrication Drawing	49312	Rev. 0
Fabrication Drawing	49320	Rev. 0

The way-bill number for this package is #71064991771.

Hope you receive it before you leave.

Regards,

Ted.

DOCUMENT CONTROL LIST

DOCUMENT NO.	DOCUMENT CONTENT	REVISION
INSTALLATION DOCUMENTS 49301	External Attachment Provisions Installation	0
FABRICATION DOCUMENTS 49311 49312 49320	Forward Fitting Aft Fitting Barrel Nut	0 0 0
ENGINEERING DOCUMENTS ER493.01 FMS493.01	Engineering Report Flight Manual Supplement	0 0
APPROVAL:	ORIGINAL DATE: 19 May, 2002 REVISION DATE:	AERO DESIGN LTD. 1045 McTavish Rd. NE Calgary, Alberta T2E 7G9 Ph. (403) 250-8027 Fax. (403) 250-8333
	SHEET 1 OF 1	BELL 206L SERIES External Attachment Provisions
	DCL493	Rev. 0

AERO DESIGN LTD.

FMS493.01

Approval Holder:
Aero Design Ltd.

BELL 206L SERIES

ROTORCRAFT FLIGHT MANUAL SUPPLEMENT for the **INSTALLATION of EXTERNAL ATTACHMENT** **PROVISIONS**

Supplemental Type Certificate No. SH00-48, Issue 2

Sections I, II, III and IV of this document comprise the Transport Canada Approved sections of this Flight Manual Supplement. Compliance with Section I, Limitations, is mandatory.

Section V and any subsequent sections if present are Unapproved and are provided for information only.

The information and data contained in this Flight Manual Supplement supersede or supplement that contained in the basic Approved Flight Manual for the Bell 206L Series when fitted with External Attachment Provisions. For limitations, procedures and performance not listed in this Flight Manual Supplement, refer to the Approved Flight Manual and other approved Flight Manual Supplements.

Revision 0
19 May, 2002

TRANSPORT CANADA APPROVED

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III	Emergency Procedures	3
IV	Performance	3

I LIMITATIONS

1. Attachment of any equipment to the External Attachment Provisions must be approved by Transport Canada.

II NORMAL PROCEDURES

1. No change from basic Approved Flight Manual.

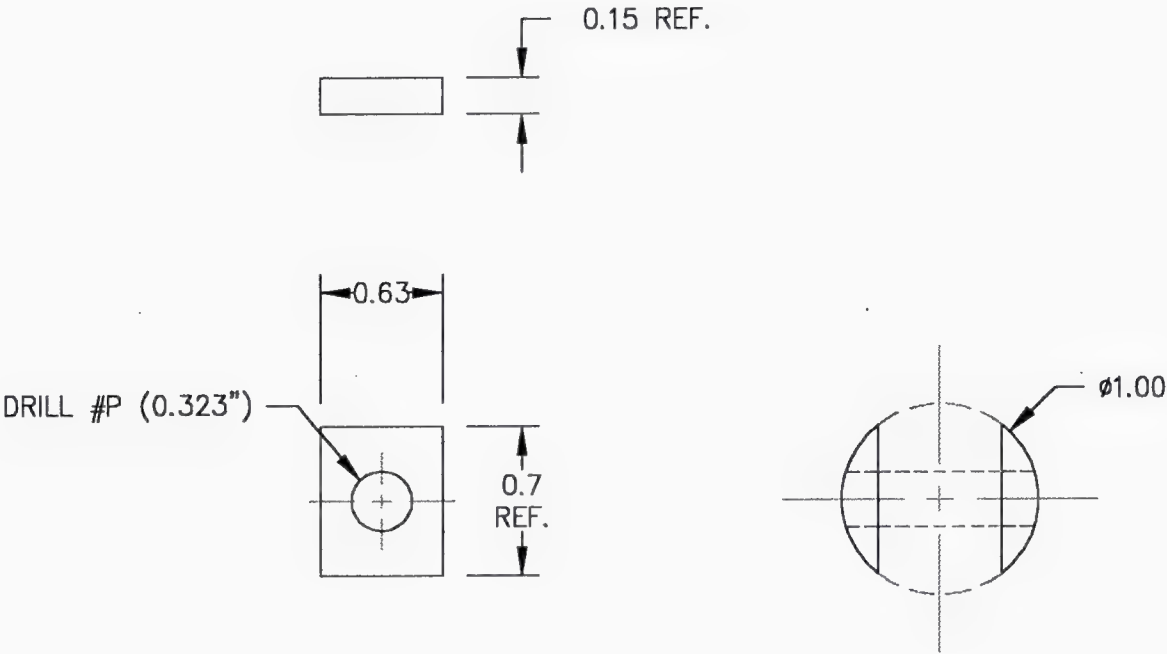
III EMERGENCY PROCEDURES

1. No change from basic Approved Flight Manual.

IV PERFORMANCE

1. No change from basic Approved Flight Manual.

LIST OF MATERIALS					
PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
49319-01	01	SEMI-CIRCULAR WASHER	6061 ALUMINUM		Ø1.00" BAR



01 SEMI-CIRCULAR WASHER
(MAKES TWO)

NOTES:
1. REMOVE ALL BURRS AND SHARP EDGES.

APPROVALS	DATE
DRAWN: STEVEN FAHEY	JUN 06/02
CHECKED: E. BURGOIN	JUN 06/02
STRESS:	

AERO DESIGN LTD.
ENGINEERING CONSULTANTS
1045 McTAVISH ROAD N.E.
CALGARY, ALBERTA T2E 7G9

1			
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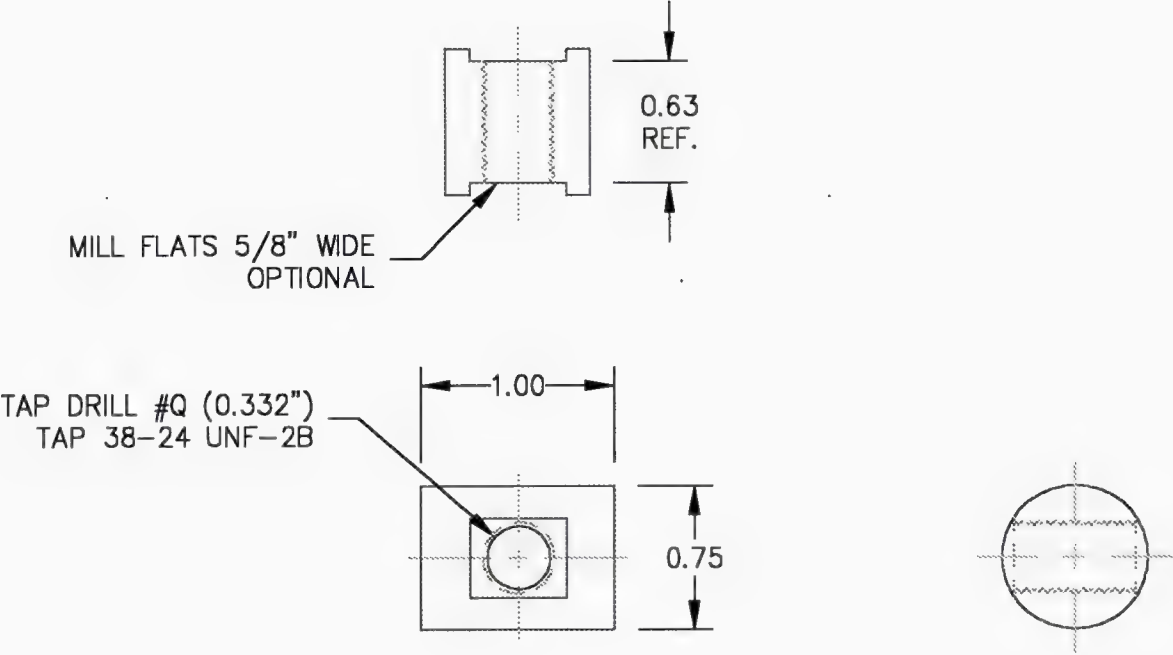
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TOLERANCES ON:

DECIMALS	ANGLES
X.XXX ±0.010	±1/2°
X.XX ±0.03	
X.X ±0.1	

SEMI-CIRCULAR WASHER
FABRICATION

SCALE 1 : 1	DWG. SIZE	DWG. NO.	REV.	
SHEET 1 OF 1	LGL	49319	0	

LIST OF MATERIALS					
PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
49320-01	01	BARREL NUT	AISI 304 SS	MIL-S-5059	ø3/4" BAR



01 BARREL NUT

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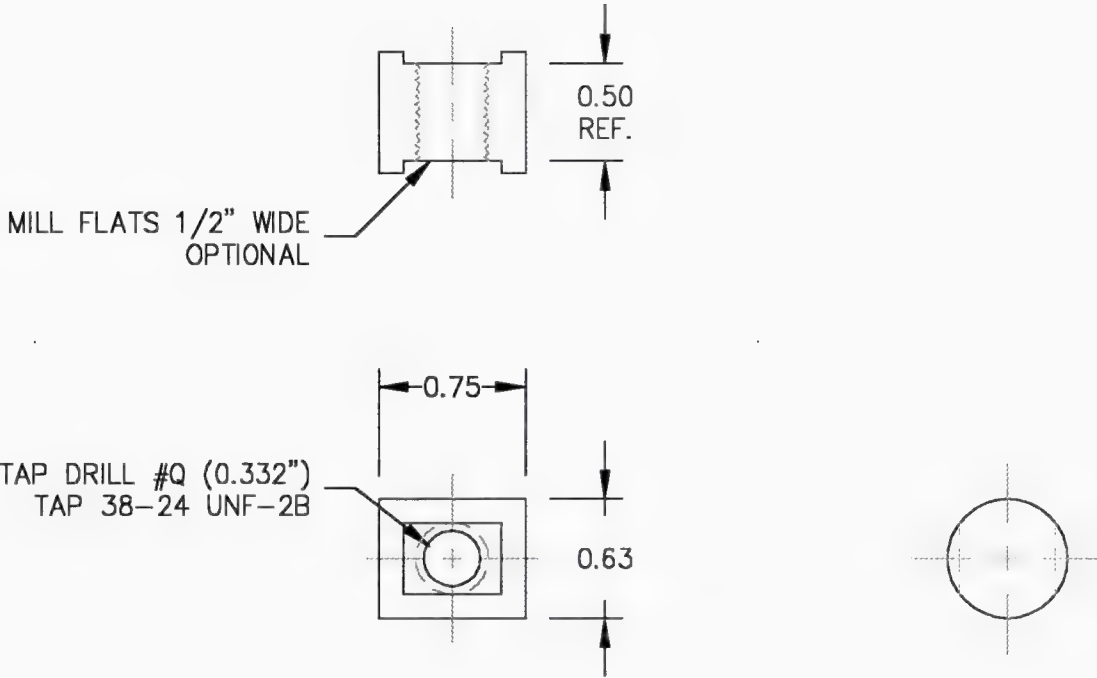
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X.X ±0.1

BARREL NUT
FABRICATION

SCALE 1 : 1	DWG. SIZE	DWG. NO.	REV.
SHEET 1 OF 1	LGL	49320	1

LIST OF MATERIALS					
PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
49320-01	01	BARREL NUT	AISI 304 SS	MIL-S-5059	ø5/8" BAR



01 BARREL NUT

NOTES:
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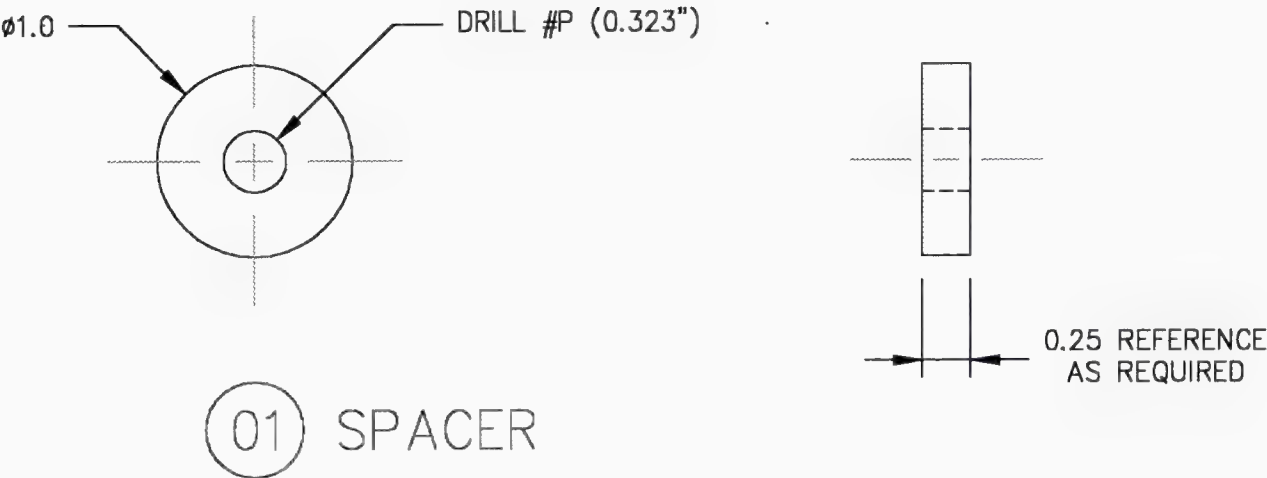
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X.XX ±0.03	
X.X ±0.1	

BARREL NUT FABRICATION			
SCALE 1 : 1	DWG. SIZE	DWG. NO.	REV.
SHEET 1 OF 1	LGL	49320	0

LIST OF MATERIALS					
PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
49321-01	01	SPACER	6061 ALUMINUM		Ø1.0" BAR



NOTES:
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X.XXX ±0.010	±1/2°
X.XX ±0.03	
X.X ±0.1	

SPACER FABRICATION			
SCALE 1 : 1	DWG. SIZE	DWG. NO.	REV.
SHEET 1 OF 1	LGL	49321	0

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1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

F A X C O V E R S H E E T

DATE: May 16, 2002 TIME: 3:13 PM
TO: Leavens PHONE: 735-4996
FAX: 735-4998
FROM: S. Fahey PHONE: 403-250-8027
Aero Design Ltd. FAX: 403-250-8333

Number of pages including cover sheet: 1

RE: HARDWARE ORDER

<u>AN Bolts:</u>		<u>MS Nuts:</u>	
AN3-14A	50	MS21044N3	100
AN3-15A	50	MS21044N4	100
AN3-16A	50		
AN4-24A	50		
AN4-25A	50		
AN6-20A	50		
AN6-21A	50		

<u>AN Washers:</u>			
AN960JD10L	100	AN960JD10	100
AN960JD416L	100	AN960JD416	100
AN960JD616L	100	AN960JD616	100

Regards,
Steven Fahey

FAXED

From :

PHONE No. : 00

May.09 2002 11:02AM P01

272

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

F A X C O V E R S H E E T

DATE: May 9, 2002 TIME: 10:58 AM
TO: M&M Aerospace H/W PHONE: 310-900-1300
Pamela Horton FAX: 310-900-1319
FROM: S. Fahey PHONE: 403-250-8027
Aero Design Ltd. FAX: 403-250-8333

Number of pages including cover sheet: 1

RE: PRICE QUOTE

I would like a quote on the following items, noting which are in stock and which are not:

Barrel Nuts (w. retainer):

<u>MFR.</u>	<u>P/N</u>	<u>QTY</u>	
SPS	114LH7456T-064	25	X
SPS	2452-064	25	X
SPS	2552-064	25	X
SPS	2752-064	25	40 ⁰⁰ ea stk
SPS	42FBN-824	25	X
SPS	59764B-624A	25	X
SPS	B12670-6	25	X
SPS	1F6BF577-6	25	X
SPS	RMLH2577-064	25	X

Regards,

Pamela Horton
M & M AEROSPACE
DATE: 5/9/02
Fax: 310-900-1319
Ph: 310-900-1315

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

F A X C O V E R S H E E T

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<u>MFR.</u>	<u>P/N</u>	<u>QTY</u>
SPS	114LH7456T-064	25
SPS	2452-064	25
SPS	2552-064	25
SPS	2752-064	25
SPS	42FBN-624	25
SPS	59764B-624A	25
SPS	B12670-6	25
SPS	1F6BF577-6	25
SPS	RMLH2577-064	25

Regards,

***AERO* DESIGN LTD.**

1045 McTavish Rd. N.E.

Calgary, Alberta

T2E 7G9

8 May, 2001

Transport Canada
Aircraft Certification Division
Edmonton Aircraft Certification Office
11th Floor, Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E6

Attn: Mr. Jack Staal

Re: Installation of External Mounting Provisions on Bell 206L

Out file: 493

Your file: n/a

Jack:

I have enclosed the substantiation report for this project with this letter.

Engineering Report

ER493.01

Rev. 0

Please provide written agreement to the Compliance Program sent to you on 2 May. Ted is willing to sign off on the items that are within his delegation.

Regards,



S. Fahey, Technologist

Encl.

AERO Design Ltd.

ENGINEERING REPORT ER493.01

BELL 206L SERIES

External Attachment Provisions

Approved: E. Burgoin, P. Eng.

Prepared by: S. Fahey

Date: 30 April, 2002
Revision 0

AERO Design Ltd.: Mailing Address: 1045 McTavish Road N E, Calgary Alberta T2E 7G9
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E-Mail: aerodsgn@telusplanet.net

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1.0 INTRODUCTION

The Landing gear legs on Bell 206L helicopters are attached to the fuselage with four bearing fittings. The forward and aft sets of fittings are very similar, except that they accommodate different sizes of cross-tubes.



Figure 1.1 L/H Aft Fitting

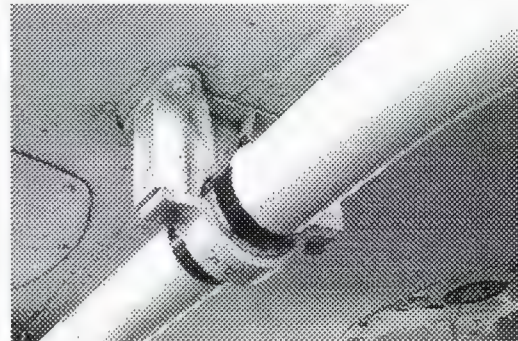


Figure 1.2 R/H Aft Fitting

Attempts to mount external equipment onto Bell 206 helicopters have been hampered by service problems with cross-tubes which are prone to cracking (see AD's CF-95-17, and CF-98-43). This prevents the use of the cross-tubes as an equipment mounting location. The existing type approved fittings, shown above, do not offer convenient mounting locations.

New landing gear fittings are designed that incorporate convenient provisions to mount equipment, while performing all of the same functions as the original fittings.

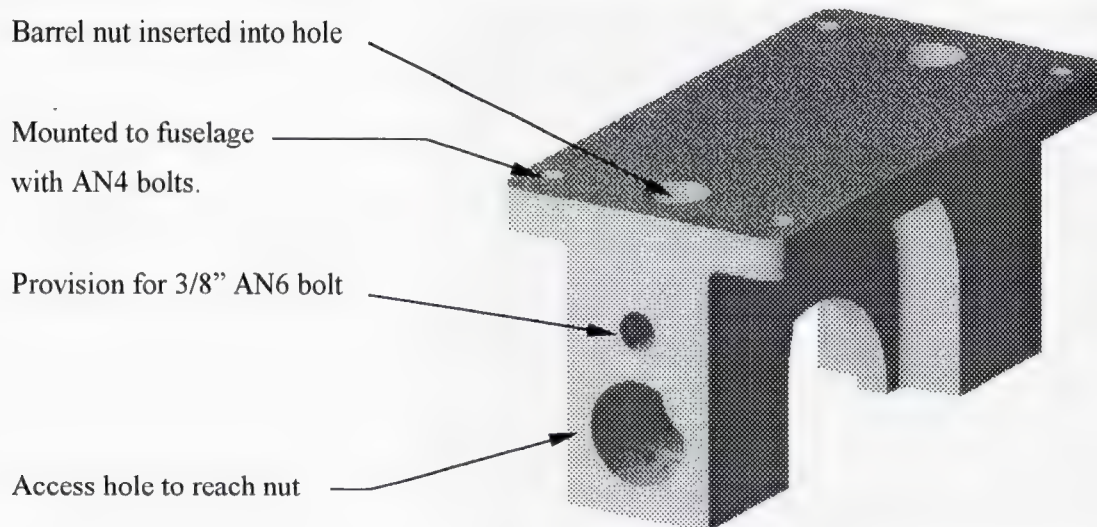


Figure 1.3 Provision for Attachment of External Equipment

2.0 REFERENCE

Bell 206L Illustrated Parts Manual

Bell 206L Maintenance Manual

Mil-Handbook-5H

Bruhn, Analysis and Design of Flight Vehicle Structures

Aero Design Ltd. Drawings 49301 and 49302

Aero Design Ltd. Test Report TR261.02, July 25, 1997

3.0 BASIS OF CERTIFICATION

To be applicable to all models of the 206L series, the certification basis of the 206L-4 is used:

Bell 206L-4

Canadian Type Approval

H-92

FAA Type Certificate

H2SW

FAR Part 27 dated 2 October 1964 Amendment 27-1 through 27-24 with:

27.79, 27.143, 27.173, 27.175, 27.1519, 27.1585, 27.1587 at Amdt 27-1;

27.1093, 27.1545 at Amdt 27-8;

27.45, 27.141, 27.1309 at Amdt 27-20;

27.2, 27.307, 27.337, 27.351, 27.427, 27.501, 27.571, 27.613, 27.629, 27.663, 27.674, 27.685, 27.727, 27.783, 27.807, 27.861, 27.865 at Amdt 27-28;

and 27.391, 27.395, 27.397, 27.681, 27.1357, 27.1361, replaced by 6.220, 6.225, 6.323, 6.623, 6.624, 6.625, 6.626 of CAR Part 6 dated 6 December 1956 Amendment 6-1 through 6-4.

Exceptions to FAR 27 are the deletion of: 27.71, 27.177, 27.399, 27.562, 27.610, 27.954, 27.1195, 27.1322.

Equivalent Safety Findings:

1. Skid Landing Gear (Drop Test) FAR 27.723, 27.725, and 27.727
2. Fuel Tanks (Drop Test)- FAR 27.965(c)(1) and (c)(2). FAR Part 36 dated 3 November 1969 Amendment 36-1 through 36-14, Subpart H.

4.0 ANALYSIS OF CURRENT AIRWORTHINESS DIRECTIVES (AD'S)

Airworthiness Directives applicable to the Bell 206L series have been reviewed and no conflicting AD's were found. See Appendix A.

AD's CF-95-17 and CF-98-43 refer to cracking of the landing gear cross-tubes, found particularly around riveted connections at the saddles, and at the fuselage mounting points. By changing the fittings, the loads on the landing gear cross-tubes are not changed. Therefore the fittings are unaffected by these AD's.

5.0 ORIGINAL CAST MATERIAL STRENGTH

The original parts from Bell Helicopter;

Part Numbers: 206-033-108-001 (forward)

206-033-109-001 (aft)

are cast aluminum. It is likely that a high-strength casting alloy was used in their manufacture, and that tight quality control has been exercised.

It can, therefore, be reasonably assumed that the highest material strength properties have been attained for the aluminum alloy casting. Mil-Hdbk-5H specifies the following maximum strength values, in the designated areas for castings:

Table 5.1

ALLOY	Specification	F _{tu} (ksi)	F _{su} (ksi)	F _{bru} (e/D=2.0) (ksi)
* A201	Mil-A-21180	60	36	122
354	Mil-A-21180	50	31	107
C355	Mil-A-21180	50	31	107
356	AMS 4260	25	16	53
A356	Mil-A-21180	45	28	96
A357	Mil-A-21180	50	31	107
D357	AMS 4241	49	31	105
359	Mil-A-21180	47	29	101

* The casting alloy A201 has the highest allowable strength values, therefore this will be used as the basis of the strength comparison of the machined fitting.

6.0 MACHINED PROVISIONS MATERIAL STRENGTH

The fitting is machined from 6061-T651 aluminum plate. Mil-Hdbk-5H specifies the following allowable strength values:

Table 6.1

ALLOY	Specification	F _{tu} (ksi)	F _{su} (ksi)	F _{bru} (e/D=2.0) (ksi)
6061-T651	QQ-A-250/11	42	27	88

7.0 COMPARISON OF MATERIAL STRENGTH

Comparison of the properties of the cast alloy with the 6061 shows the following relative strength:

Table 7.1

	Ftu (ksi)	Fsu (ksi)	Fbru (ksi)
STRENGTH COMPARISON	70%	75%	72%

8.0 DIMENSIONAL COMPARISON

The machined fitting is dimensionally similar enough to the original part to ensure interchangeability, but material is thicker in places to increase strength. Figure 8.1 below shows specific dimensions that are compared.

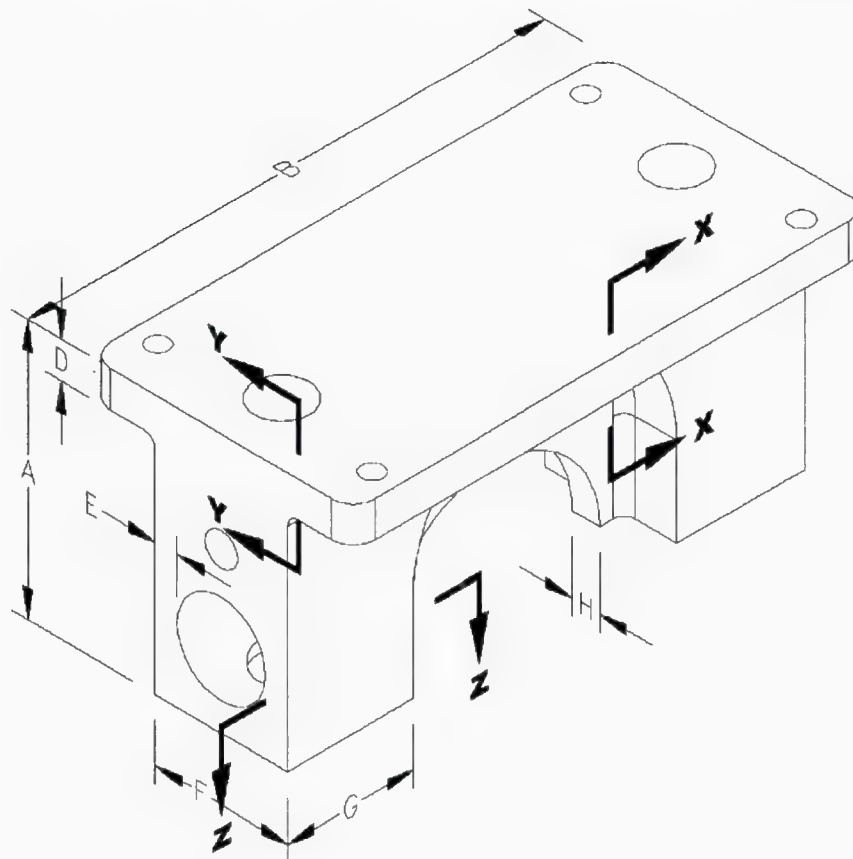


Figure 8.1 Key Dimensions of Forward Fitting
(Cross-sections shown in Figure 8.2)

Table 8.1

Dimension	Original Cast Part	Machined Part
A	2.90	2.90
B	5.88	5.88
D	0.25	0.40
E	0.125	0.250
F	1.313	1.500
G	1.313	1.438
H	0.306	0.313

Dimensions A and B are identical, to make the parts interchangeable with the originals. Dimensions D through H, however, are greater than on the original part. The extra thickness does not interfere with the function of the fittings, nor with their fit on the helicopter.

The impact of these beefed-up areas is shown below in Figure 8.2, where the cross-sectional properties are developed.

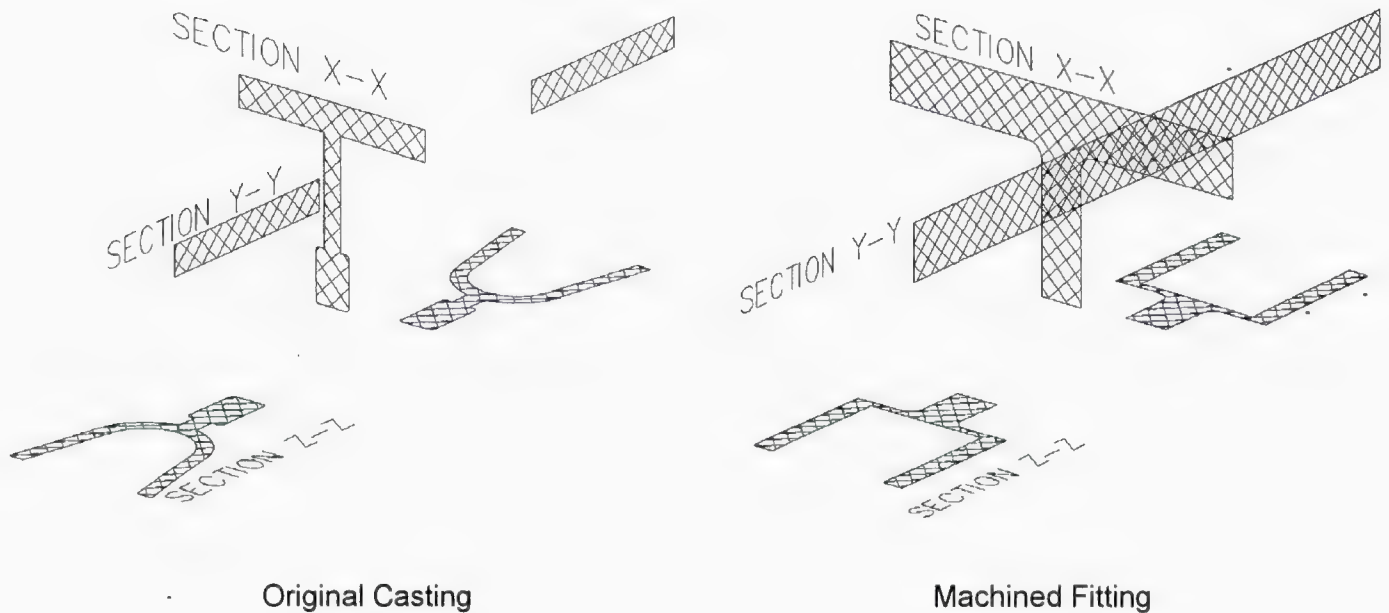


Figure 8.2 Cross Sections of Forward Fittings

Table 8.2

SECTION	CROSS-SECTIONAL AREA (in ²)	MAJOR AXIS SECTION MODULUS (in ³)	MINOR AXIS SECTION MODULUS (in ³)
Original Casting	(Weight = 0.69 lb)		
X-X	0.720	0.168	0.130
Y-Y	0.847	1.34	0.0352
Z-Z	1.13	1.54	0.216
Machined Part	(Weight = 1.75 lb)		
X-X	1.61	0.603	0.223
Y-Y	2.35	2.30	0.157
Z-Z	2.20	3.01	0.805
Comparison	(254% heavier)		
X-X	224%	359%	172%
Y-Y	277%	172%	446%
Z-Z	195%	195%	373%

9.0 STRENGTH COMPARISON OF PARTS

The 6061-T651 material is, at worst, 70% as strong as the original cast alloy, according to Table 8.1.

The machined part has section properties at least 72% better than the original part, according to Table 8.2.

Therefore:

$$(70\% \text{ material strength}) \times (172\% \text{ section properties}) = 120\% \text{ relative strength}$$

Under all of the various loads the fitting will experience in service, the machined fitting is greater in strength than the original part.

Margin of Safety is Positive

10.0 LOADS

10.1 Design Load Factors, FAR 27

FAR 27.561(b)(3)

Ultimate Upward Emergency Landing Load Factor:	$n_{e_up} := 1.5$
Ultimate Forward Emergency Landing Load Factor:	$n_{e_fwd} := 4.0$
Ultimate Sideward Emergency Landing Load Factor:	$n_{e_side} := 2.0$
Ultimate Downward Emergency Landing Load Factor:	$n_{e_down} := 4.0$

FAR 27.625 Fitting Factor: $n_{ff} := 1.15$

FAR 27.303 Safety Factor: $n_{sf} := 1.5$

FAR 27.337(a)

Limit Positive Manouvering LoadFactor: $n_{man} := 3.5$

$n_{man_ult} := n_{man} \cdot n_{sf}$ Ultimate Positive Manouvering LoadFactor: $n_{man_ult} = 5.25$

Limit Negative Manouvering LoadFactor: $n_{man_n} := -1.0$

$n_{man_neg_u} := n_{man_n} \cdot n_{sf}$ Ultimate Negative Manouvering LoadFactor: $n_{man_neg_u} = -1.5$

CRITICAL ULTIMATE LOAD FACTORS:

Upward: Ultimate Upward Emergency Landing Load Factor: $n_{e_up} = 1.50$

Forward: Ultimate Forward Emergency Landing Load Factor: $n_{e_fwd} = 4.00$

Sideward: Ultimate Sideward Emergency Landing Load Factor: $n_{e_side} = 2.00$

Downward: Ultimate Positive Manouvering LoadFactor: $n_{man_ult} = 5.25$

Note: Forward, Sideward, and Downward Emergency Landing Load Factors may not apply to some installations below the cabin, as deflection or failure in these directions may not endanger the occupants. Assessment of these factors must be performed for each installation on the provisions.

10.2 Allowable Loads on Fitting

The following loads have been selected as design allowable loads for any equipment to be attached to the provision. Reference sheets are provided in Appendix B.

Limit Load on AN6 bolt in Longitudinal axis of helicopter. $P_{x_lim} = 1507 \cdot \text{lbf}$

Limit Load on AN6 bolt in Lateral axis of helicopter. $P_{y_lim} = 754 \cdot \text{lbf}$

Limit Load on AN6 bolt in Vertical axis of helicopter. $P_{z_lim} = 1978 \cdot \text{lbf}$

$P_{x_ult} = P_{x_lim} \cdot f \cdot n \cdot sf$ Ultimate Load on AN6 bolt in Longitudinal axis of helicopter. $P_{x_ult} = 2600 \cdot \text{lbf}$

$P_{y_ult} = P_{y_lim} \cdot f \cdot n \cdot sf$ Ultimate Load on AN6 bolt in Lateral axis of helicopter. $P_{y_ult} = 1300 \cdot \text{lbf}$

$P_{z_ult} = P_{z_lim} \cdot f \cdot n \cdot sf$ Ultimate Load on AN6 bolt in Vertical axis of helicopter. $P_{z_ult} = 3413 \cdot \text{lbf}$

10.3 Allowable Combined Loads

The Vertical Allowable Load is reduced when Lateral and/or Longitudinal Loads are applied simultaneously. For any equipment installation that applies combined loads, the allowable Ultimate Vertical Load can be found on the diagram in Appendix B, or by using the following equation:

$$P_z = 3413 - 0.1756 (2 \times P_y + P_x) \quad (\text{see Appendix B})$$

for any combination of Lateral, Longitudinal, and Vertical combined loads.

Vertical, Longitudinal and Lateral loads all apply some tension to the AN4 bolts that mount the fittings to the fuselage.

The inserts in the fuselage that attach the fittings are the critical part of the load path in tension, based on the test results in Engineering Report 261.02. The load tests were performed only up to the point where the jiggling of the test piece began to cause it to deform, but the insert itself had not failed. These numbers are used as ultimate loads, to restrict the loads that can be applied to the external attachment provisions on the fittings.

Torque limits on the AN4 bolts are from 70 to 90 inch-pounds.

	Maximum Wrenching Torque applied to AN4 bolt when installed.	$T_b := 90 \cdot \text{in} \cdot \text{lbf}$
$f_t := \frac{T_b}{0.0018 \text{in}^3}$	Tensile stress on AN4 bolt due to wrench torque. (ref. W. Bruce)	$f_t = 50 \cdot \text{ksi}$
	Cross sectional area of AN4 Bolt in tension.	$A_{AN4_t} = 0.033 \cdot \text{in}^2$
$P_{\text{torq4}} := f_t \cdot A_{AN4_t}$	Tensile load on AN4 bolt due to wrench torque.	$P_{\text{torq4}} = 1670 \cdot \text{lbf}$

10.4 Weight of Landing Gear

	Approximate Weight of High Skid Landing Gear.	$W_{\text{gear}} := 150 \cdot \text{lbf}$
$P_{\text{gear}} := \frac{W_{\text{gear}}}{16}$	Weight of landing gear per bolt.	$P_{\text{gear}} = 9.4 \cdot \text{lbf}$
$P_{\text{tu_gear}} := P_{\text{gear}} \cdot n_{\text{man}} \cdot n_{\text{sf}} \cdot n_{\text{ff}}$	Ultimate load per bolt from landing gear weight.	$P_{\text{tu_gear}} = 57 \cdot \text{lbf}$

11.0 PROVISION GEOMETRY

11.1 Fitting

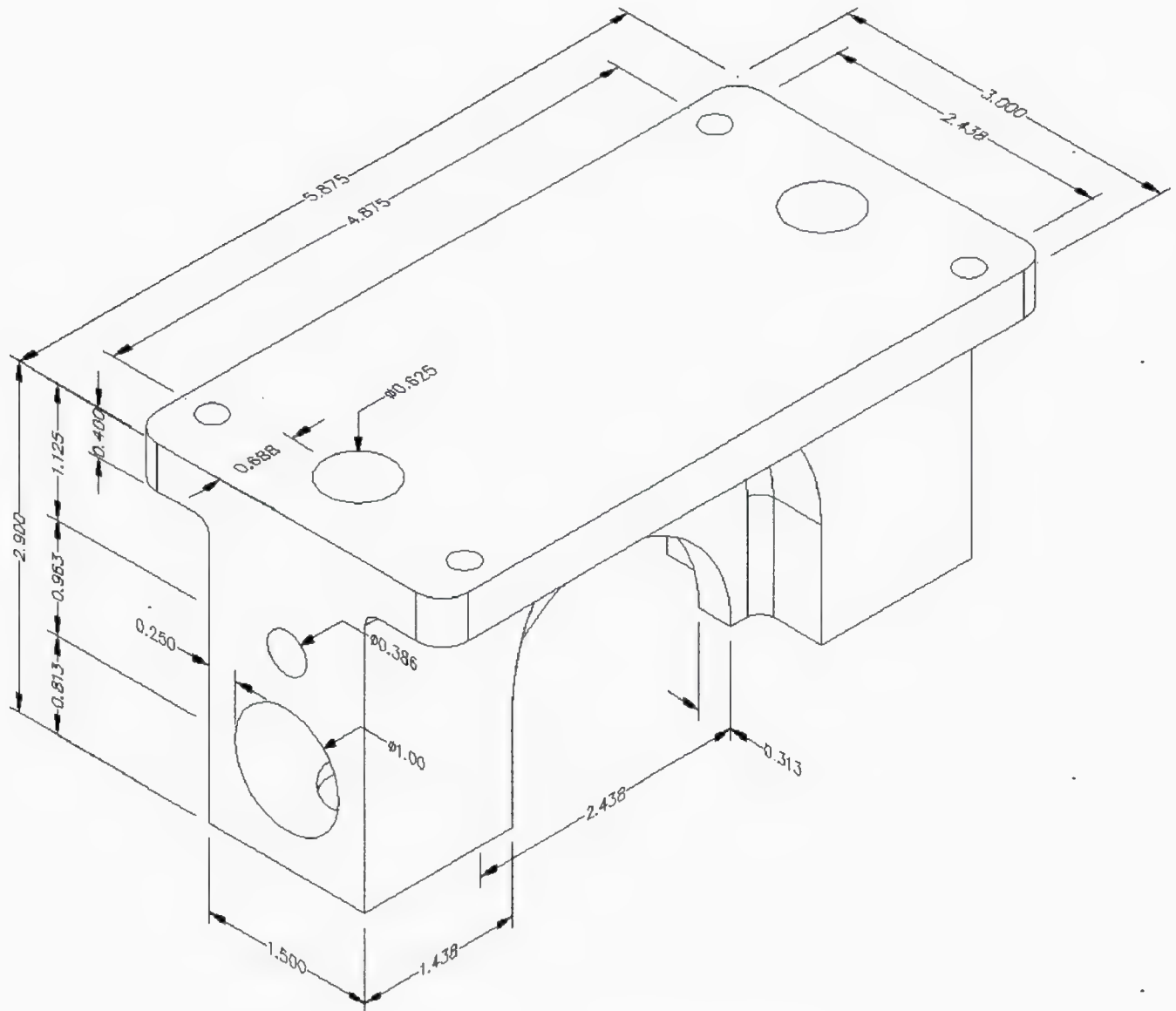


Figure 11.1 Dimensions of Fitting

The forward fitting will be used for the structural analysis. The aft fitting has a sloped face where the provisions mount, hence extra material, but it is otherwise identical to the front fitting. The analysis is simplified by not accounting for the sloped face. The dimensions listed below are shown in Figure 11.1.

Length of Fitting.	$a := 5.875 \text{ in}$
Lengthwise spacing of AN4 bolts.	$b := 4.875 \text{ in}$
Width of Fitting.	$c := 3.00 \text{ in}$
Crosswise spacing of AN4 bolts.	$d := 2.438 \text{ in}$
Height of fitting	$e := 2.90 \text{ in}$
Thickness of top flange.	$f := 0.40 \text{ in}$
Distance from barrel nut hole to side of fitting.	$g := 0.69 \text{ in}$
Distance of AN6 Bolt from top of fitting.	$h := 1.13 \text{ in}$
Distance of AN6 Bolt from access hole.	$i := 0.96 \text{ in}$
Thickness of web beside access hole.	$j := 0.25 \text{ in}$
Diameter of access hole.	$k := 1.00 \text{ in}$
Width of leg.	$m := 1.50 \text{ in}$
Depth of leg.	$n := 1.44 \text{ in}$
Diameter of bearing area.	$s := 2.44 \text{ in}$
Width of bearing area	$t := 0.31 \text{ in}$

11.2 Fasteners

AN6 BOLT:

Diameter of AN6 bolt

$$D_{AN6} := 0.375 \text{ in}$$

Cross sectional area of AN6 Bolt in shear.

$$A_{AN6_s} := 0.110 \text{ in}^2$$

Cross sectional area of AN6 Bolt in tension.

$$A_{AN6_t} := 0.0824 \text{ in}^2$$

AN4 BOLT:

Diameter of AN4 Bolt.

$$D_{AN4} := 0.250 \text{ in}$$

Cross sectional area of AN4 Bolt in shear.

$$A_{AN4_s} := 0.0491 \text{ in}^2$$

Cross sectional area of AN4 Bolt in tension.

$$A_{AN4_t} := 0.0334 \text{ in}^2$$

BARREL NUT:

Diameter of barrel nut hole

$$D_{bn} := 0.625 \text{ in}$$

Length of barrel nut.

$$l_{bn} := 0.75 \text{ in}$$

12.0 STRESS ANALYSIS OF FITTING

12.1 Material Properties

AN6 BOLT:

Ultimate Tensile Strength of AN6 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{tu_AN6} := 10300\text{ lbf}$$

Ultimate Single Shear Strength of AN6 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{su_AN6} := 8280\text{ lbf}$$

Ultimate Tensile Strength of AN6 Bolt
(Ref. Mil-Hdbk-5H).

$$F_{tu_AN6} := 125\text{ ksi}$$

Ultimate Shear Strength of AN6 Bolt
(Ref. Mil-Hdbk-5H).

$$F_{su_AN6} := 75\text{ ksi}$$

AN4 BOLT:

Ultimate Tensile Strength of AN4 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{tu_AN4} := 4170\text{ lbf}$$

Ultimate Single Shear Strength of AN4 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{su_AN4} := 3680\text{ lbf}$$

Ultimate Tensile Strength of AN4 Bolt
(Ref. Mil-Hdbk-5H).

$$F_{tu_AN4} := 160\text{ ksi}$$

Ultimate Shear Strength of AN4 Bolt
(Ref. Mil-Hdbk-5H).

$$F_{su_AN4} := 95\text{ ksi}$$

FITTING:

Ultimate Tensile Strength of 6061-T651
aluminum plate. (Ref. Mil-Hdbk-5H)

$$F_{tu_6061} := 42\text{ ksi}$$

Yield Tensile Strength of 6061-T651
aluminum plate. (Ref. Mil-Hdbk-5H)

$$F_{ty_6061} := 35\text{ ksi}$$

Ultimate Shear Strength of 6061-T651
aluminum plate. (Ref. Mil-Hdbk-5H)

$$F_{su_6061} := 27\text{ ksi}$$

Ultimate Bearing Strength of 6061-T651
aluminum plate. (Ref. Mil-Hdbk-5H)

$$F_{bru_6061} := 67\text{ ksi}$$

Yield Bearing Strength of 6061-T651
aluminum plate. (Ref. Mil-Hdbk-5H)

$$F_{bry_6061} := 49\text{ ksi}$$

The barrel nut that retains the AN6 bolt is fabricated from AISI 304 stainless steel rod.

Ultimate Shear Strength of AISI 304 stainless steel annealed condition (Ref. Mil-Hdbk-5H).

$$F_{su_301} := 50 \text{ ksi}$$

Diameter of AN6 bolt.

$$D_{AN6} := 0.375 \text{ in}$$

Pitch Diameter of AN6 bolt.

$$pd_{AN6} := 0.345 \text{ in}$$

$$A_{thrd} := (\pi \cdot pd_{AN6}) \cdot \left(\frac{D_{AN6}}{2} \right)$$

Thread helical area.

$$A_{thrd} = 0.203 \cdot \text{in}^2$$

$$P_{tu_bn} := F_{su_301} \cdot A_{thrd}$$

Ultimate Tensile Strength of Barrel Nut.

$$P_{tu_bn} = 10161 \cdot \text{lbf}$$

The strength of the barrel nut is just slightly less than the strength of the AN6 bolt.
From here on, the ultimate strength of the barrel nut will be used.

$$P_{tu_AN6} := 10100 \text{ lbf}$$

12.2 Strength of AN6 Attachment Bolt

Fastener Strength:

Ultimate Tensile Strength of AN6 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{tu_AN6} = 10100 \cdot \text{lbf}$$

Ultimate Single Shear Strength of AN6 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{su_AN6} = 8280 \cdot \text{lbf}$$

Applied Loads:

Ultimate Tensile Load on AN6 bolt
in Longitudinal axis of helicopter.

$$P_{x_ult} = 2600 \cdot \text{lbf}$$

Ultimate Shear Load on AN6 bolt
in Lateral axis of helicopter (not critical).

$$P_{y_ult} = 1300 \cdot \text{lbf}$$

Ultimate Shear Load on AN6 bolt
in Vertical axis of helicopter.

$$P_{z_ult} = 3413 \cdot \text{lbf}$$

$$P_{torq6} := f_t \cdot A_{AN6_t}$$

Tensile load on AN6 bolt due to wrench torque.

$$P_{torq6} = 2014 \cdot \text{lbf}$$

Ultimate Tensile Load exceeds the load applied by pre-tension.

Ultimate Strength:

$$MS := \frac{P_{tu_AN6}}{P_{x_ult}} - 1$$

Ultimate Tensile Margin of Safety (forward).

$$MS = 2.9$$

$$MS := \frac{P_{su_AN6}}{P_{y_ult}} - 1$$

Ultimate Shear Margin of Safety (sideward).

$$MS = 5.4$$

$$MS := \frac{P_{su_AN6}}{P_{z_ult}} - 1$$

Ultimate Shear Margin of Safety (vertical).

$$MS = 1.4$$

12.3 Strength of Fitting in Vertical Load**Vertical Allowable Loads**Ultimate Shear Load on AN6 bolt
in Vertical axis of helicopter.

$$P_{z_ult} = 3413 \cdot \text{lbf}$$

Limit Shear Load on AN6 bolt
in Vertical axis of helicopter.

$$P_{z_lim} = 2275 \cdot \text{lbf}$$

The vertical load applies stress to the cross-sectional area shown in Figure 12.1. The bolt is in contact with the hole outboard of the barrel nut, so only this portion of the area will be considered in the analysis.

Distance from barrel nut hole to side of fitting.

$$g = 0.69 \cdot \text{in}$$

Distance of AN6 Bolt from access hole.

$$i = 0.96 \cdot \text{in}$$

Width of leg.

$$m = 1.50 \cdot \text{in}$$

Diameter of barrel nut hole

$$D_{bn} = 0.63 \cdot \text{in}$$

Diameter of AN6 bolt

$$D_{AN6} = 0.38 \cdot \text{in}$$

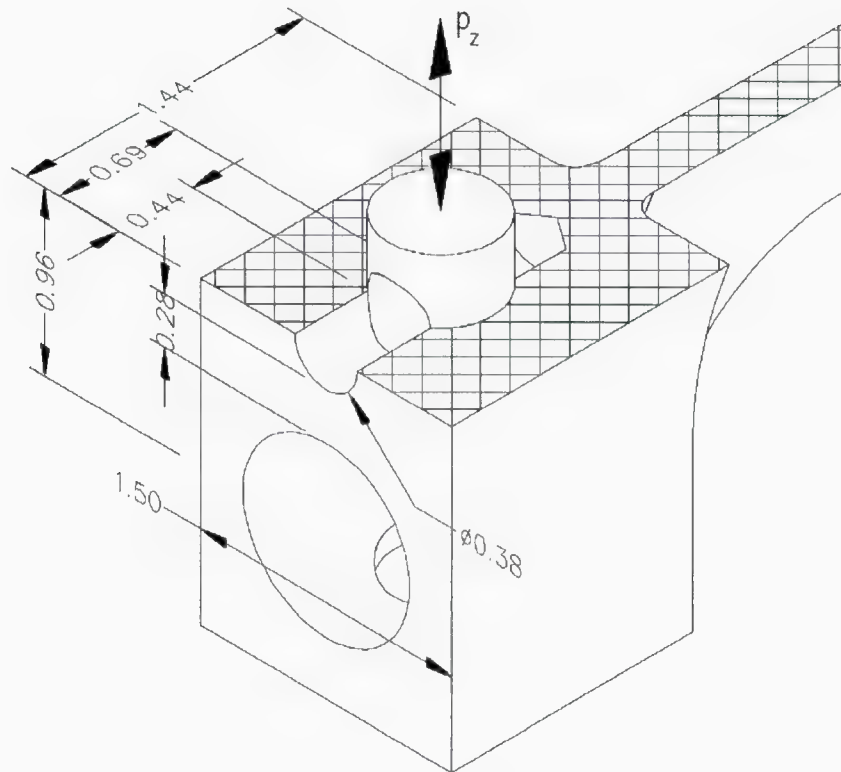


Figure 12.1 Horizontal Cross-Section Through Fitting

Ultimate Tensile Strength:

$$A_{t_v} := (m - D_{AN6}) \cdot \left(g - \frac{D_{bn}}{2} \right) \quad \text{Effective cross-section area in tension.} \quad A_{t_v} = 0.42 \cdot \text{in}^2$$

$$f_{tu_v} := \frac{P_{z_ult}}{A_{t_v}} \quad \text{Tensile stress applied by ultimate vertical load.} \quad f_{tu_v} = 8.0 \cdot \text{ksi}$$

$$MS := \frac{F_{tu_6061}}{f_{tu_v}} - 1 \quad \text{Ultimate Tensile Margin of Safety.} \quad MS = 4.2$$

Yield Tensile Strength:

$$f_{ty_v} := \frac{P_{z_lim}}{A_{t_v}} \quad \text{Tensile stress applied by limit vertical load.} \quad f_{ty_v} = 5.4 \cdot \text{ksi}$$

$$MS := \frac{F_{ty_6061}}{f_{ty_v}} - 1 \quad \text{Yield Tensile Margin of Safety.} \quad MS = 5.5$$

Ultimate Bearing Strength:

$$A_{br} := (D_{AN6}) \cdot \left(g - \frac{D_{bn}}{2} \right)$$

Effective cross-section area in bearing.

$$A_{br} = 0.14 \cdot \text{in}^2$$

$$f_{bru_v} := \frac{P_{z_ult}}{A_{br}}$$

Bearing stress applied by ultimate vertical load.

$$f_{bru_v} = 24.1 \cdot \text{ksi}$$

$$MS := \frac{F_{bru_6061}}{f_{bru_v}} - 1$$

Ultimate Bearing Margin of Safety.

$$MS = 1.8$$

Yield Bearing Strength:

$$f_{bry_v} := \frac{P_{z_lim}}{A_{br}}$$

Bearing stress applied by limit vertical load.

$$f_{bry_v} = 16.1 \cdot \text{ksi}$$

$$MS := \frac{F_{bry_6061}}{f_{bry_v}} - 1$$

Yield Bearing Margin of Safety.

$$MS = 2.0$$

Ultimate Shear Tear-out Strength:

$$A_s := 2 \cdot (i) \cdot \left(g - \frac{D_{bn}}{2} \right)$$

Effective cross-section area in shear.

$$A_s = 0.72 \cdot \text{in}^2$$

$$f_{s_v} := \frac{P_{z_ult}}{A_s}$$

Shear stress applied by ultimate vertical load.

$$f_{s_v} = 4.7 \cdot \text{ksi}$$

$$MS := \frac{F_{su_6061}}{f_{s_v}} - 1$$

Ultimate Shear Margin of Safety.

$$MS = 4.7$$

12.4 Strength of Fitting in Lateral Load

Ultimate Shear Load on AN6 bolt
in Lateral axis of helicopter.

$$P_{y_ult} = 1300 \cdot \text{lbf}$$

Limit Shear Load on AN6 bolt
in Lateral axis of helicopter.

$$P_{y_lim} = 867 \cdot \text{lbf}$$

The lateral load applies stress to the cross-sectional area shown in Figure 12.2. The bolt is in contact with the hole outboard of the barrel nut, so only this portion of the area will be considered in the analysis.

Distance from barrel nut hole to side of fitting.

$$g = 0.69 \cdot \text{in}$$

Distance of AN6 Bolt from top of fitting.

$$h = 1.00 \cdot \text{in}$$

Distance of AN6 Bolt from access hole.

$$i = 0.59 \cdot \text{in}$$

Width of leg.

$$m = 1.50 \cdot \text{in}$$

Diameter of barrel nut hole

$$D_{bn} = 0.63 \cdot \text{in}$$

Diameter of AN6 bolt

$$D_{AN6} = 0.38 \cdot \text{in}$$

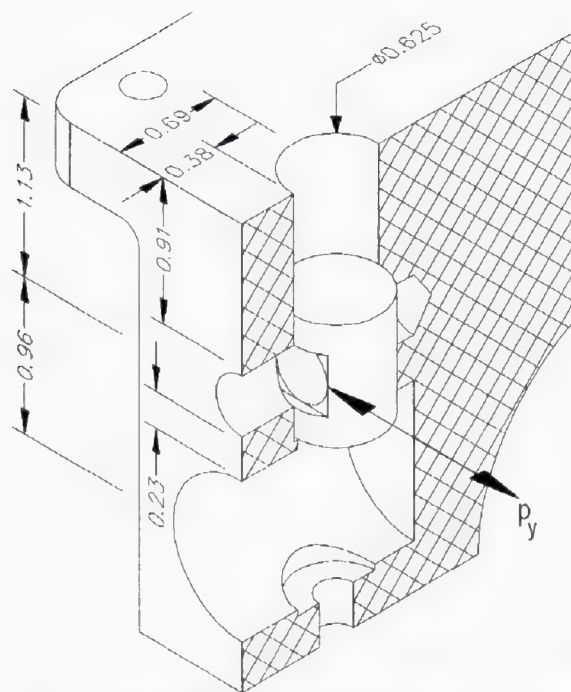


Figure 12.2 Vertical Cross-Section Through Fitting

Ultimate Tensile Strength:

$A_{t_s} := (0.23 \text{ in} + 0.91 \text{ in}) \cdot (0.38 \text{ in})$ Effective cross-section area in tension.

$$A_{t_s} = 0.43 \cdot \text{in}^2$$

$$f_{tu_s} := \frac{P_{y_ult}}{A_{t_s}}$$

Tensile stress applied by ultimate side load.

$$f_{tu_s} = 3.0 \cdot \text{ksi}$$

$$MS := \frac{F_{tu_6061}}{f_{tu_s}} - 1$$

Ultimate Tensile Margin of Safety.

$$MS = 13.0$$

Limit Tensile Strength:

$$f_{ty_s} := \frac{P_{y_lim}}{A_{t_s}}$$

Tensile stress applied by limit side load.

$$f_{ty_s} = 2.0 \cdot \text{ksi}$$

$$MS := \frac{F_{ty_6061}}{f_{ty_s}} - 1$$

Yield Tensile Margin of Safety.

$$MS = 16.5$$

Ultimate Bearing Strength:

$$A_{br} := (D_{AN6}) \cdot \left(g - \frac{D_{bn}}{2} \right)$$

Effective cross-section area in bearing.

$$A_{br} = 0.14 \cdot \text{in}^2$$

$$f_{bru_s} := \frac{P_{y_ult}}{A_{br}}$$

Bearing stress applied by ultimate side load.

$$f_{bru_s} = 9.2 \cdot \text{ksi}$$

$$MS := \frac{F_{bru_6061}}{f_{bru_s}} - 1$$

Ultimate Bearing Margin of Safety.

$$MS = 6.3$$

Limit Bearing Strength:

$$f_{bry_s} := \frac{P_{y_lim}}{A_{br}}$$

Bearing stress applied by limit side load.

$$f_{bry_s} = 6.1 \cdot \text{ksi}$$

$$MS := \frac{F_{bry_6061}}{f_{bry_s}} - 1$$

Yield Bearing Margin of Safety.

$$MS = 7.0$$

Ultimate Shear Tear-out Strength:

$$A_s := 2 \cdot \left(\frac{m}{2} \right) \cdot \left(g - \frac{D_{bn}}{2} \right)$$

Effective cross-section area in shear.

$$A_s = 0.57 \cdot \text{in}^2$$

$$f_{s_s} := \frac{P_{y_ult}}{A_s}$$

Shear stress applied by ultimate side load.

$$f_{s_s} = 2.3 \cdot \text{ksi}$$

$$MS := \frac{F_{su_6061}}{f_{s_s}} - 1$$

Ultimate Shear Margin of Safety.

$$MS = 10.8$$

12.5 Strength of Fitting in Longitudinal Load

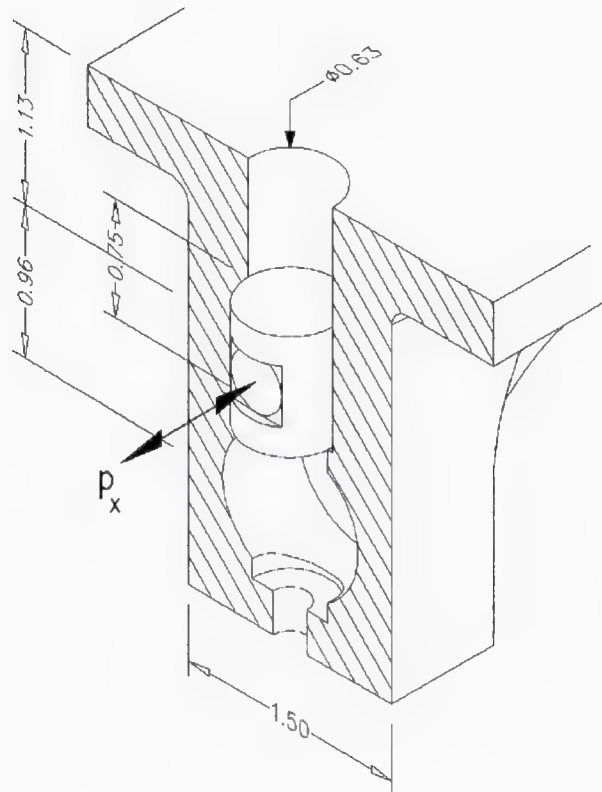


Figure 12.3 Transverse Cross-Section Through Fitting

Ultimate Tensile Load on AN6 bolt
in Longitudinal axis of helicopter.

$$P_{x_ult} = 2600 \cdot \text{lbf}$$

Limit Tensile Load on AN6 bolt
in Longitudinal axis of helicopter.

$$P_{x_lim} = 1733 \cdot \text{lbf}$$

The longitudinal load applies stress to the cross-sectional area shown in Figure 12.3. The barrel nut bears against the wall of its hole in this case. Pre-tension due to bolt torque has been relieved by the ultimate tensile load, and is therefore ignored.

Distance from barrel nut hole to side of fitting.

$$g = 0.69 \cdot \text{in}$$

Distance of AN6 Bolt from top of fitting.

$$h := 1.00 \cdot \text{in}$$

Distance of AN6 Bolt from access hole.

$$i := 0.59 \cdot \text{in}$$

Length of barrel nut.

$$l_{bn} = 0.75 \cdot \text{in}$$

Diameter of barrel nut hole

$$D_{bn} = 0.63 \cdot \text{in}$$

Diameter of AN6 bolt

$$D_{AN6} = 0.38 \cdot \text{in}$$

Ultimate Tensile Strength:

$$A_{t_f} := (l_{bn}) \cdot (m - D_{bn})$$

Effective cross-section area in tension.

$$A_{t_f} = 0.66 \cdot \text{in}^2$$

$$f_{tu_f} := \frac{P_{x_ult}}{A_{t_f}}$$

Tensile stress applied by ultimate forward load.

$$f_{tu_f} = 4.0 \cdot \text{ksi}$$

$$MS := \frac{F_{tu_6061}}{f_{tu_f}} - 1$$

Ultimate Tensile Margin of Safety.

$$MS = 9.6$$

Yield Tensile Strength:

$$f_{ty_f} := \frac{P_{x_lim}}{A_{t_f}}$$

Tensile stress applied by limit forward load.

$$f_{ty_f} = 2.6 \cdot \text{ksi}$$

$$MS := \frac{F_{ty_6061}}{f_{ty_f}} - 1$$

Yield Tensile Margin of Safety.

$$MS = 12.3$$

Ultimate Bearing Strength:

$$A_{br} := D_{bn} \cdot l_{bn} - A_{AN6_s}$$

Effective cross-section area in bearing.

$$A_{br} = 0.36 \cdot \text{in}^2$$

$$f_{br_f} := \frac{P_{x_ult}}{A_{br}}$$

Bearing stress applied by forward load.

$$f_{br_f} = 7.2 \cdot \text{ksi}$$

$$MS := \frac{F_{bru_6061}}{f_{br_f}} - 1$$

Ultimate Bearing Margin of Safety.

$$MS = 8.2$$

Limit Bearing Strength:

$$f_{bry_f} := \frac{P_{x_lim}}{A_{br}}$$

Bearing stress applied by limit forward load.

$$f_{bry_f} = 4.8 \cdot \text{ksi}$$

$$MS := \frac{F_{bry_6061}}{f_{bry_f}} - 1$$

Yield Bearing Margin of Safety.

$$MS = 9.1$$

Ultimate Shear Tear-out Strength:

$$A_s := 2 \cdot g \cdot l_{bn}$$

Effective cross-section area in shear.

$$A_s = 1.03 \cdot \text{in}^2$$

$$f_{s_f} := \frac{P_{x_ult}}{A_s}$$

Shear stress applied by ultimate forward load.

$$f_{s_f} = 2.5 \cdot \text{ksi}$$

$$MS := \frac{F_{su_6061}}{f_{s_f}} - 1$$

Ultimate Shear Margin of Safety.

$$MS = 9.7$$

12.6 Strength of AN4 Attachment Bolts

Fastener Strength:

Ultimate Tensile Strength of AN4 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{tu_AN4} = 4170 \cdot \text{lbf}$$

Ultimate Single Shear Strength of AN4 Bolt
(Ref. Mil-Hdbk-5H).

$$P_{su_AN4} = 3680 \cdot \text{lbf}$$

Applied Loads:

Limit Longitudinal Load.

$$P_{x_lim} = 1733 \cdot \text{lbf}$$

Ultimate Longitudinal Load.

$$P_{x_ult} = 2600 \cdot \text{lbf}$$

Limit Lateral Load.

$$P_{y_lim} = 867 \cdot \text{lbf}$$

Ultimate Lateral Load.

$$P_{y_ult} = 1300 \cdot \text{lbf}$$

Limit Vertical Load.

$$P_{z_lim} = 2275 \cdot \text{lbf}$$

Ultimate Vertical Load.

$$P_{z_ult} = 3413 \cdot \text{lbf}$$

Tensile load on AN4 bolt due to wrench torque.

$$P_{torq4} = 1670 \cdot \text{lbf}$$

Ultimate Tensile Load exceeds the load applied by pre-tension.

Ultimate load per bolt from landing gear weight.

$$P_{tu_gear} = 57 \cdot \text{lbf}$$

The loads are applied to the end of the fitting as shown in Figure 12.4. The half inch offset is included to allow for the thickness of the lug that attaches equipment to the provision.

Length of Fitting.

$$a = 5.88 \cdot \text{in}$$

Lengthwise spacing of AN4 bolts.

$$b = 4.88 \cdot \text{in}$$

Crosswise spacing of AN4 bolts.

$$d = 2.44 \cdot \text{in}$$

Distance of AN6 Bolt from top of fitting.

$$h = 1.00 \cdot \text{in}$$

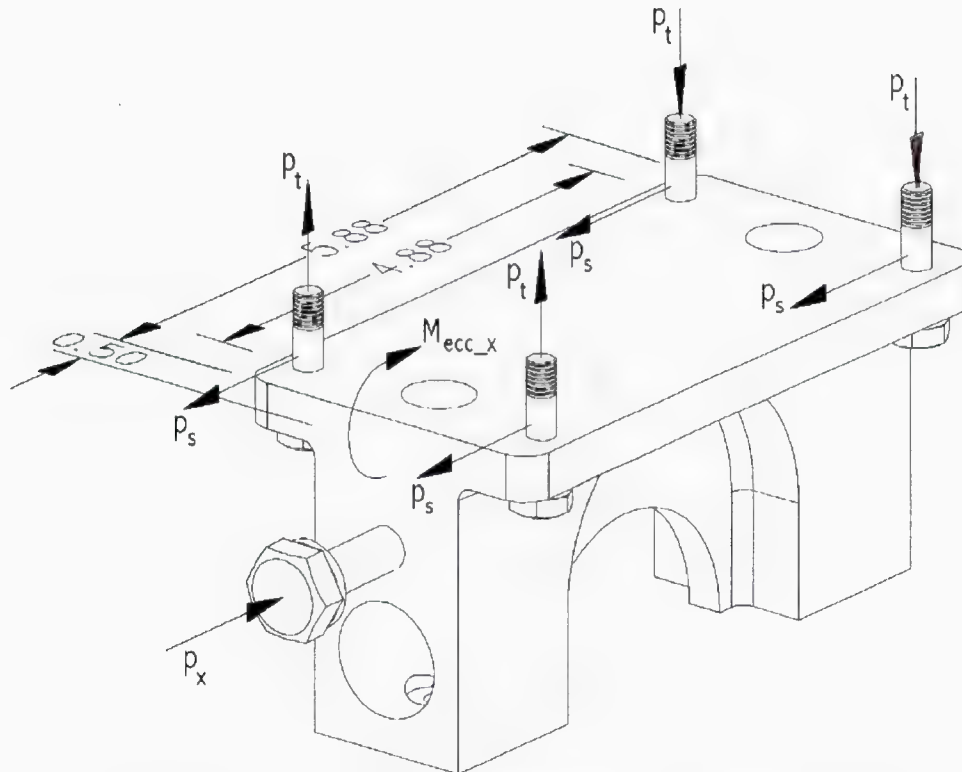


Figure 12.4 AN4 Bolt Reactions to Longitudinal Load

Ultimate Longitudinal Load:

$$P_{su_lon} = \frac{P_{x_ult}}{4}$$

Shear is distributed evenly between 4 AN4 bolts.

$$P_{su_lon} = 650 \cdot \text{lbf}$$

$$R_s := \frac{P_{su_lon}}{P_{su_AN4}}$$

Shear Stress Ratio in AN4 Bolt.

$$R_s = 0.18$$

$$M_{ecc_x} := P_{x_ult} \cdot h$$

Moment applied to bolts due to eccentric load.

$$M_{ecc_x} = 2600 \cdot \text{in} \cdot \text{lbf}$$

$$P_{tu_lon} := \frac{M_{ecc_x}}{2 \cdot b}$$

Tensile reaction load due to Moment.

$$P_{tu_lon} = 267 \cdot \text{lbf}$$

$$R_t := \frac{P_{tu_lon}}{P_{tu_AN4}}$$

Tensile Stress Ratio in AN4 Bolt.

$$R_t = 0.06$$

$$R := R_t^2 + R_s^3$$

Combined Stress Ratio for AN4 Bolt.

$$R = 0.010$$

Where stress factor: $N := 5.42$

$$\text{Then: } (N \cdot R_s)^3 + (N \cdot R_t)^2 = 1.00 \quad (\text{must} = 1)$$

$$MS := N - 1$$

Ultimate Margin of Safety (Ref. Mil-Hdbk-5E, 1.5.3.5) $MS = 4.4$

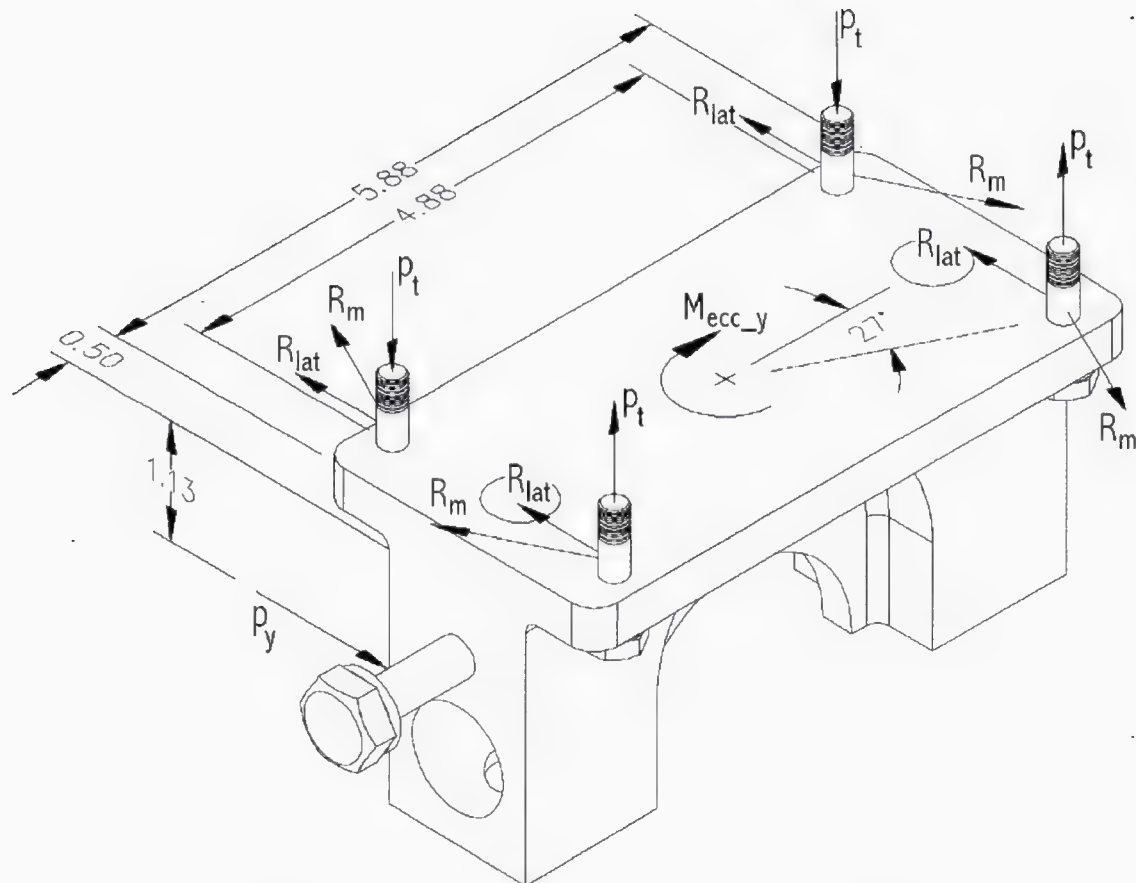


Figure 12.5 AN4 Bolt Reactions to Lateral Load

Ultimate Lateral Load:

$$R_{lat} := \frac{P_{y_ult}}{4}$$

Linear Shear load reaction on each AN4 bolt.

$$R_{lat} = 325 \cdot \text{lbf}$$

$$M_{ecc_y} := P_{y_ult} \cdot \left(\frac{a}{2} + 0.5 \text{ in} \right)$$

Moment around bolt center applied by longitudinal eccentricity of lateral load.

$$M_{ecc_y} = 4469 \cdot \text{in} \cdot \text{lbf}$$

$$r := \sqrt{\left(\frac{b}{2} \right)^2 + \left(\frac{d}{2} \right)^2}$$

Radius of bolt circle on top of fitting.

$$r = 2.73 \cdot \text{in}$$

$$R_{m_lat} := \frac{M_{ecc_y}}{4 \cdot r}$$

Eccentric Shear load reaction on each AN4 bolt.

$$R_{m_lat} = 410 \cdot \text{lbf}$$

$$\theta := \text{atan} \left(\frac{d}{b} \right)$$

Angle between reaction load vectors.

$$\theta = 26.6 \cdot \text{deg}$$

$$P_{su_lat} := \sqrt{(R_{m_lat} \cos(\theta) + R_{lat})^2 + (R_{m_lat} \sin(\theta))^2}$$

Resultant shear force from combined shear components.

$$P_{su_lat} = 716 \cdot \text{lbf}$$

$$R_s := \frac{P_{su_lat}}{P_{su_AN4}}$$

Shear Stress Ratio in AN4 Bolt.

$$R_s = 0.19$$

$$M_{ecc_z} := P_{y_ult} \cdot h$$

Moment around top of fitting applied by vertical eccentricity of lateral load.

$$M_{ecc_z} = 1300 \cdot \text{in} \cdot \text{lbf}$$

$$P_{tu_lat} := \frac{M_{ecc_z}}{2 \cdot d}$$

Eccentric Tensile reaction on each AN4 bolt.

$$P_{tu_lat} = 267 \cdot \text{lbf}$$

$$R_t := \frac{P_{tu_lat}}{P_{tu_AN4}}$$

Tensile Stress Ratio in AN4 Bolt.

$$R_t = 0.06$$

$$R := R_t^2 + R_s^3$$

Combined Stress Ratio for AN4 Bolt.

$$R = 0.011$$

Where stress factor: $N := 4.96$ Then: $(N \cdot R_s)^3 + (N \cdot R_t)^2 = 1.00$ (must = 1)

$$MS := N - 1$$

Ultimate Margin of Safety (Ref. Mil-Hdbk-5E, 1.5.3.5)

$$MS = 4.0$$

Ultimate Vertical Load:

Applied Moment around R_1 is counteracted by the reaction load at R_2 , therefore:

$$M_{R1} := P_{z_ult} \cdot \left(\frac{a}{2} + \frac{b}{2} + 0.50 \text{ in} \right)$$

Moment at bolts R1 due to applied vertical load.

$$M_{R1} = 20048 \cdot \text{in} \cdot \text{lbf}$$

$$R_2 := \frac{M_{R1}}{2 \cdot b}$$

Reaction load in each bolt closest to provision.

$$R_2 = 2056 \cdot \text{lbf}$$

$$R_1 := \frac{P_{z_ult}}{2} - R_2$$

Reaction load in each bolt farthest from provision.

$$R_1 = -350 \cdot \text{lbf}$$

$$P_{tu_z} := R_2 + P_{tu_gear}$$

Tensile load on each AN4 bolt.

$$P_{tu_z} = 2113 \cdot \text{lbf}$$

$$MS := \frac{P_{tu_AN4}}{P_{tu_z}} - 1$$

Ultimate Tensile Margin of Safety.

$$MS = 1.0$$

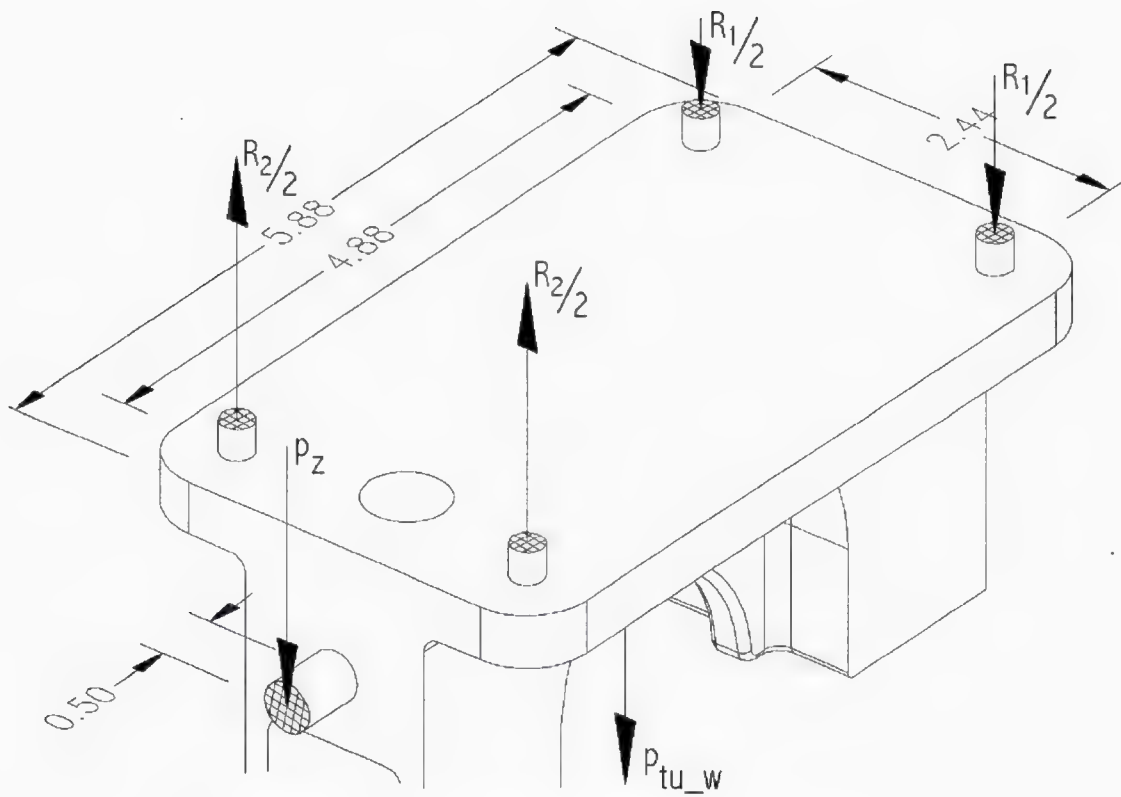


Figure 12.6 AN4 Bolt Reactions to Vertical Load

12.7 Bending Strength of Fuselage Mounting Lugs

Ultimate Shear Strength of 6061-T651 aluminum plate. (ref. Mil-Hdbk-5H).

$$F_{su_6061} = 27 \cdot \text{ksi}$$

Ultimate Tensile Strength of 6061-T651 aluminum plate. (ref. Mil-Hdbk-5H).

$$F_{tu_6061} = 42 \cdot \text{ksi}$$

Ultimate Tensile reaction Load on each AN4 bolt.

$$P_{tu_z} = 2113 \cdot \text{lb} \cdot \text{f}$$

$$P_{ty_z} := \frac{P_{tu_z}}{1.5}$$

Limit Tensile reaction Load on each AN4 bolt.

$$P_{ty_z} = 1409 \cdot \text{lb} \cdot \text{f}$$

Vertical reaction loads bend the lugs, as shown in Figure 12.7

Length of Fitting.

$$a = 5.88 \cdot \text{in}$$

Crosswise spacing of AN4 bolts.

$$d = 2.44 \cdot \text{in}$$

Thickness of top flange.

$$f = 0.40 \cdot \text{in}$$

Width of leg.

$$m = 1.50 \cdot \text{in}$$

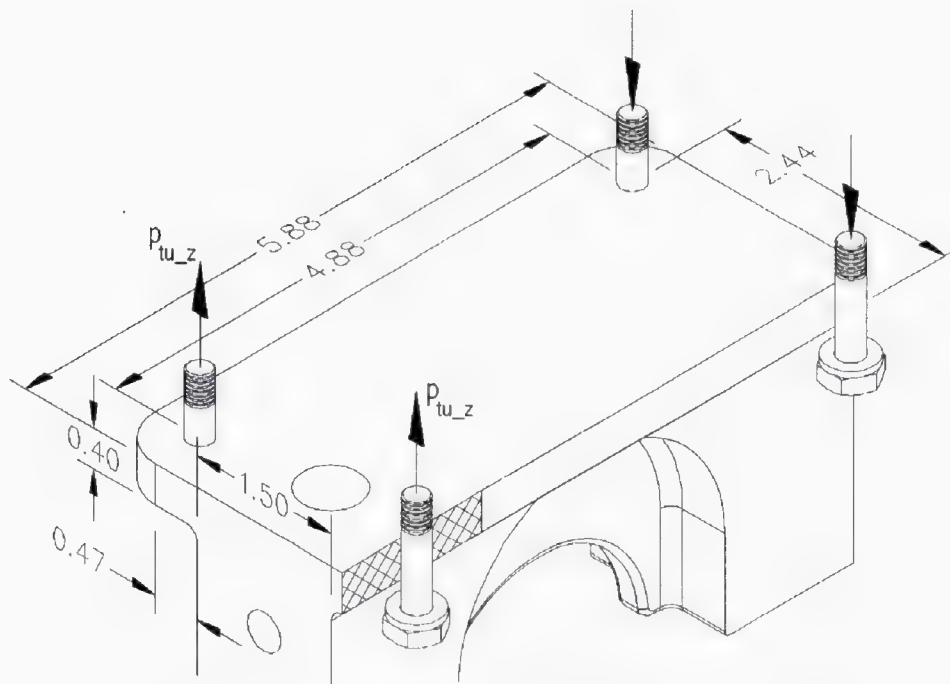


Figure 12.7

Bolt Reaction Loads on Top Lugs

Ultimate Bending Strength:

$$x := \frac{d}{2} - \frac{m}{2}$$

Bending moment arm.

$$x = 0.47 \cdot \text{in}$$

$$M := p_{tu_z} \cdot x$$

Bending moment applied by bolt reaction load to lug. $M = 991 \cdot \text{in} \cdot \text{lbf}$

$$I_{\text{flange}} := \frac{(1.5 \cdot \text{in}) \cdot f^3}{12}$$

Moment of Inertia of effective part of top lug.

$$I_{\text{flange}} = 0.008 \cdot \text{in}^4$$

$$f_{b_ult} := \frac{M \cdot \left(\frac{f}{2}\right)}{I_{\text{flange}}}$$

Bending stress applied by bolt reaction load.

$$f_{b_ult} = 25 \cdot \text{ksi}$$

$$MS := \frac{F_{tu_6061}}{f_{b_ult}} - 1$$

Ultimate Bending Margin of Safety.

$$MS = 0.7$$

Limit Bending Strength:

$$M_{\text{lim}} := p_{ty_z} \cdot x$$

Bending moment applied by bolt reaction load to lug. $M_{\text{lim}} = 661 \cdot \text{in} \cdot \text{lbf}$

$$f_{b_lim} := \frac{M_{\text{lim}} \cdot \left(\frac{f}{2}\right)}{I_{\text{flange}}}$$

Bending stress applied by bolt reaction load.

$$f_{b_lim} = 17 \cdot \text{ksi}$$

$$MS := \frac{F_{ty_6061}}{f_{b_lim}} - 1$$

Yield Bending Margin of Safety.

$$MS = 1.1$$

Ultimate Shear Strength:

$$A_s := (1.5 \cdot \text{in}) \cdot f$$

Effective cross-sectional area of lug in shear.

$$A_s = 0.60 \cdot \text{in}^2$$

$$f_{su} := \frac{p_{tu_z}}{A_s}$$

Shear stress applied by bolt reaction load.

$$f_{su} = 3.5 \cdot \text{ksi}$$

$$MS := \frac{F_{su_6061}}{f_{su}} - 1$$

Ultimate Shear Margin of Safety.

$$MS = 6.7$$

12.8 Tear-Out Strength of Fuselage Mounting Lugs

Applied Loads:

Resultant reaction force due to Lateral Load. $P_{su_lat} = 716 \cdot \text{lb} \cdot \text{f}$

Shear on bolt due to Longitudinal Load (not critical). $P_{su_lon} = 650 \cdot \text{lb} \cdot \text{f}$

The loads are applied at different angles to the lug at different corners of the fitting. Assuming the load pulls straight out of the lug, as shown in Figure 12.8, is conservative.

Shear Tear-Out:

$A_s := 2 \cdot (0.28 \text{ in}) \cdot (0.40 \text{ in})$ Effective Area in Shear. $A_s = 0.22 \cdot \text{in}^2$

$f_s := \frac{P_{su_lat}}{A_s}$ Applied Shear Tear-Out Stress. $f_s = 3.2 \cdot \text{ksi}$

$MS := \frac{F_{su_6061}}{f_s} - 1$ Shear Margin of Safety. $MS = 7.5$

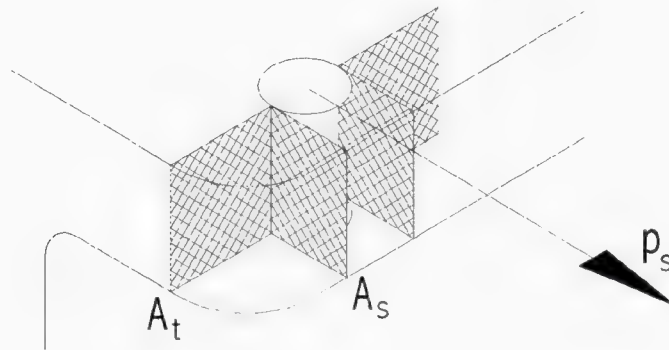


Figure 12.8 Strength of Lugs.

Bearing:

$A_{br} := D_{AN4} \cdot (0.40 \text{ in})$ Effective Area in Bearing. $A_{br} = 0.10 \cdot \text{in}^2$

$f_{br} := \frac{P_{su_lat}}{A_{br}}$ Applied Bearing Stress. $f_{br} = 7.2 \cdot \text{ksi}$

$MS := \frac{F_{bru_6061}}{f_{br}} - 1$ Bearing Margin of Safety. $MS = 8.4$

12.10

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WAS.

INSERT CRITICISM IN TENSION. BASED
ON TEST RESULTS.

Tension:

$$A_t := 2 \cdot \left(0.28 \text{ in} - \frac{D_{AN4}}{2} \right) \cdot 0.40 \text{ in} \quad \text{Effective Area in Tension.} \quad A_t = 0.12 \cdot \text{in}^2$$

$$f_t := \frac{P_{su_lat}}{A_t} \quad \text{Applied Tension Stress.} \quad f_t = 5.8 \cdot \text{ksi}$$

$$MS := \frac{F_{tu_6061}}{f_t} - 1 \quad \text{Tensile Margin of Safety.} \quad MS = 6.3$$

12.9 Strength of Fuselage Inserts

A sample of honeycomb belly panel taken from a Bell 206B helicopter was tested for ultimate strength in tension and shear on its bolt inserts. Aero Design Ltd. Test Report 261.02, dated July 25, 1997, documents the results of these tests, as shown below. * **Note:** both tests were stopped when the honeycomb failed at the jiggling support, although the insert had not yet yielded or failed.

$$\text{Tested Tensile Strength of Inserts in Honeycomb.*} \quad P_{tu_ins} := 2160 \text{ lbf}$$

$$\text{Tested Shear Strength of Inserts in Honeycomb.*} \quad P_{su_ins} := 1630 \text{ lbf}$$

Applied Loads:

$$\text{Shear due to Longitudinal Load.} \quad P_{su_lon} = 650 \cdot \text{lbf}$$

$$\text{Shear due to Lateral Load.} \quad P_{su_lat} = 716 \cdot \text{lbf}$$

$$\text{Tension due to Vertical Load.} \quad P_{tu_z} = 2113 \cdot \text{lbf}$$

$$\text{Tension pre-load in AN4 bolt due to torque. (not critical).} \quad P_{torq4} = 1670 \cdot \text{lbf}$$

Ultimate Strength:

$$MS := \frac{P_{tu_ins}}{P_{tu_z}} - 1 \quad \text{Tensile Margin of Safety (vertical reaction)*} \quad MS = 0.02$$

$$MS := \frac{P_{su_ins}}{P_{su_lat}} - 1 \quad \text{Shear Margin of Safety (sideward reaction)*} \quad MS = 1.28$$

$$MS := \frac{P_{su_ins}}{P_{su_lon}} - 1 \quad \text{Shear Margin of Safety (forward reaction)*} \quad MS = 1.51$$

13.0 FATIGUE ANALYSIS OF FITTING

13.1 Applied Load Cycles

Drag Loads:

Drag is applied once per flight when helicopter reaches cruise speed. Repeated Forward loads may be applied due to the geometry of some equipment installations, but may not exceed the value below.

$$P_{x_max} := \frac{P_{x_ult}}{n_{e_fwd} \cdot n_{ff}}$$

Maximum Longitudinal Load (cruise):

$$P_{x_max} = 565 \cdot \text{lbf}$$

Minimum Longitudinal Load (ground):

$$P_{x_min} := 0 \cdot \text{lbf}$$

$$R_x := \frac{P_{x_min}}{P_{x_max}}$$

Stress Ratio for longitudinal load cycle.

$$R_x = 0.00$$

Frequency of longitudinal load cycle.

$$N_x := \frac{1 \cdot \text{cycle}}{\text{flight}}$$

Side Loads:

Every flight has some component of side loads when the helicopter turns or moves laterally. An abrupt left, then right turn is assumed once per flight.

$$P_{y_max} := \frac{P_{y_ult}}{n_{e_side} \cdot n_{ff}}$$

Maximum Side Load (right):

$$P_{y_max} = 565 \cdot \text{lbf}$$

$$P_{y_min} := \frac{-P_{y_ult}}{n_{e_side}}$$

Minimum Side Load (left):
Load may reverse from left to right.

$$P_{y_min} = -650 \cdot \text{lbf}$$

$$R_y := \frac{P_{y_min}}{P_{y_max}}$$

Stress Ratio for sideward load cycle.

$$R_y = -1.15$$

Frequency of sideward load cycle.

$$N_y := \frac{1 \cdot \text{cycle}}{\text{flight}}$$

Vertical Loads:

The weight of the installed equipment on the provisions applies load to the fittings when the helicopter is not in use. A typical flight is assumed to contain one acceleration of 0.5g up and down. It is expected that this may be exceeded on a limited number of occasions during the lifetime of the helicopter, but not enough to be significant to the life of provision.

$$p_{z_max} := \frac{p_{z_ult}}{n_{man_ult} \cdot n_{ff}} \cdot 1.5 \quad \text{Maximum Vertical Load (positive manouvering):} \quad p_{z_max} = 848 \cdot \text{lbf}$$

$$p_{z_min} := \frac{p_{z_ult}}{n_{man_ult} \cdot n_{ff}} \cdot 0.5 \quad \text{Minimum Vertical Load (negative manouvering):} \quad p_{z_min} = 283 \cdot \text{lbf}$$

$$R_z := \frac{p_{z_min}}{p_{z_max}} \quad \text{Stress Ratio for vertical load cycle.} \quad R_z = 0.33$$

$$\text{Frequency of vertical load cycle.} \quad N_z := \frac{1 \cdot \text{cycle}}{\text{flight}}$$

The bending load applied by vertical loads to the top lugs of the fitting is also important in the fatigue analysis. The same stress ratio and number of load cycles are applied.

$$R_2 := \frac{\left(\frac{p_{z_max}}{n_{ff}} \right) \cdot \left(\frac{a}{2} + \frac{b}{2} + 0.5 \text{ in} \right)}{b} \quad \text{Reaction load in bolts closest to provision.} \quad R_2 = 888 \cdot \text{lbf}$$

$$p_{r_max} := \frac{R_2}{2} + \frac{p_{tu_gear}}{n_{man_ult} \cdot n_{ff}} \quad \text{Maximum Vertical Load on each AN4 bolt: (positive manouvering):} \quad p_{r_max} = 454 \cdot \text{lbf}$$

$$p_{r_min} := p_{r_max} R_z \quad \text{Minimum Vertical Load on each AN4 bolt: (negative manouvering):} \quad p_{r_min} = 151 \cdot \text{lbf}$$

Vibration:

Vibration in flight is insignificant.

13.2 Fatigue Strength of Fasteners

AN6 Bolt:

Maximum Longitudinal Load (cruise): $P_{x_max} = 565 \cdot \text{lbf}$

Tensile load on AN6 bolt due to wrench torque. $P_{\text{torq}6} = 2014 \cdot \text{lbf}$

The working load does not exceed the wrenching pre-load. The tension in the bolt is therefore static, and fatigue does not apply (ref. Bruhn, C13.18).

AN4 Bolt:

Tensile load on each AN4 bolt. $P_{r_max} = 454 \cdot \text{lbf}$

Tensile load on AN4 bolt due to wrench torque. $P_{\text{torq}4} = 1670 \cdot \text{lbf}$

The working load does not exceed the wrenching pre-load. The tension in the bolt is therefore static, and fatigue does not apply.

13.3 Fatigue Strength of Fitting

Fatigue due to repeated vertical loads:

	Maximum Vertical Load:	$P_{Z_max} = 848 \cdot \text{lbf}$
	Minimum Vertical Load:	$P_{Z_min} = 283 \cdot \text{lbf}$
	Stress Ratio for vertical load cycle.	$R_Z = 0.33$
	Frequency of vertical load cycle.	$N_Z = 1 \cdot \frac{\text{cycle}}{\text{flight}}$
	Stress Concentration Factor for notched specimen.	$K_t := 3.3$
	Effective cross-section area in tension.	$A_{t_v} = 0.42 \cdot \text{in}^2$
$f_{t_v} := \frac{P_{Z_max}}{A_{t_v}}$	Tensile stress applied by vertical load.	$f_{t_v} = 2.0 \cdot \text{ksi}$
$s_{max} := \frac{P_{Z_max}}{A_{t_v}} \cdot K_t$	Maximum Stress at stress concentration.	$s_{max} = 6.6 \cdot \text{ksi}$
$s_{eq} := s_{max} (1 - R_Z)^{0.63}$	Equivalent Stress (ref. Mil-Hdbk-5H, Figure 3.6.2.2.8)	$s_{eq} = 5.1 \cdot \text{ksi}$
$N_{fail} := 10^{20.68 - 9.84 \cdot \log(s_{eq})}$	Number of cycles to failure	$N_{fail} = 5 \cdot 10^{13} \cdot \text{flights}$

The life of the provision exceeds the life of helicopter.

Fatigue due to repeated lateral loads:

	Maximum Side Load:	$P_{y_max} = 565 \cdot \text{lbf}$
	Minimum Side Load:	$P_{y_min} = -650 \cdot \text{lbf}$
	Stress Ratio for side load cycle.	$R_y = -1.15$
	Frequency of side load cycle.	$N_y = 1 \cdot \frac{\text{cycle}}{\text{flight}}$
	Stress Concentration Factor for notched specimen.	$K_t = 3.30$
	Effective cross-section area in tension.	$A_{t_s} = 0.43 \cdot \text{in}^2$
$f_{t_s} := \frac{P_{y_max}}{A_{t_s}}$	Tensile stress applied by side load.	$f_{t_s} = 1.3 \cdot \text{ksi}$
$s_{max} := \frac{P_{y_max}}{A_{t_s}} \cdot K_t$	Maximum Stress at stress concentration.	$s_{max} = 4.3 \cdot \text{ksi}$
$s_{eq} := s_{max} (1 - R_y)^{0.63}$	Equivalent Stress	$s_{eq} = 7.0 \cdot \text{ksi}$
$N_{fail} := 10^{20.68 - 9.84 \cdot \log(s_{eq})}$	Number of cycles to failure	$N_{fail} = 2 \cdot 10^{12} \cdot \text{flights}$
	The life of the provision exceeds the life of helicopter.	

Fatigue due to repeated longitudinal loads:

	Maximum Drag Load:	$P_{x_max} = 565 \cdot \text{lbf}$
	Minimum Drag Load:	$P_{x_min} = 0 \cdot \text{lbf}$
	Stress Ratio for drag load cycle.	$R_x = 0.00$
	Frequency of dragload cycle.	$N_x = 1 \cdot \frac{\text{cycle}}{\text{flight}}$
	Stress Concentration Factor for notched specimen.	$K_t = 3.30$
	Effective cross-section area in tension.	$A_{t_f} = 0.66 \cdot \text{in}^2$
$f_{t_f} := \frac{P_{x_max}}{A_{t_f}}$	Tensile stress applied by drag load.	$f_{t_f} = 0.9 \cdot \text{ksi}$
$s_{max} := \frac{P_{x_max}}{A_{t_f}} \cdot K_t$	Maximum Stress at stress concentration.	$s_{max} = 2.8 \cdot \text{ksi}$
$s_{eq} := s_{max} (1 - R_x)^{0.63}$	Equivalent Stress	$s_{eq} = 2.8 \cdot \text{ksi}$
$N_{fail} := 10^{20.68 - 9.84 \cdot \log(s_{eq})}$	Number of cycles to failure	$N_{fail} = 2 \cdot 10^{16} \cdot \text{flights}$
	The life of the provision exceeds the life of helicopter.	

FUSELAGE MOUNTING FLANGES:

Fatigue due to repeated bolt reaction loads:

	Maximum Reaction Load:	$P_{r_max} = 454 \cdot \text{lbf}$
	Minimum Reaction Load:	$P_{r_min} = 151 \cdot \text{lbf}$
	Stress Ratio for vertical load cycle.	$R_z = 0.33$
	Frequency of vertical load cycle.	$N_z = 1 \cdot \frac{\text{cycle}}{\text{flight}}$
	Stress Concentration Factor for notched specimen.	$K_t := 3.3$
$M_{max} := P_{r_max} \cdot x$	Bending moment applied by bolt reaction load to lug.	$M_{max} = 213 \cdot \text{in} \cdot \text{lbf}$
	Moment of Inertia of half of top lug.	$I_{flange} = 0.0080 \cdot \text{in}^4$
$f_{b_max} := \frac{M_{max} \left(\frac{f}{2} \right)}{I_{flange}}$	Bending stress applied by bolt reaction load.	$f_{b_max} = 5.3 \cdot \text{ksi}$
$s_{max} := f_{b_max} \cdot K_t$	Maximum Stress at stress concentration.	$s_{max} = 17.6 \cdot \text{ksi}$
$s_{eq} := s_{max} \left(1 - R_z \right)^{0.63}$	Equivalent Stress (ref. Mil-Hdbk-5H, Figure 3.6.2.2.8)	$s_{eq} = 13.6 \cdot \text{ksi}$
$N_{fail} := 10^{\frac{20.68 - 9.84 \cdot \log(s_{eq})}{}}$	Number of cycles to failure	$N_{fail} = 3 \cdot 10^9 \cdot \text{flights}$
	The life of the provision exceeds the life of helicopter.	

APPENDIX A

AIRWORTHINESS DIRECTIVES APPLICABLE TO THE BELL 206L SERIES

AIRWORTHINESS DIRECTIVES

Applicable to Canadian registered or manufactured aeronautical products

Database Last Updated: 2002-03-16

Directives Pertaining to Model: **BELL, 206L**

40 ADs found

Country:	AD Number:	AD Subject:	SB Reference:
CF	<u>CF-2001-33</u>	CHIP DETECTOR ASSEMBLY	206-01-96 REV A
CF	<u>CF-2001-13</u>	SOLOY ENGINE RPM SENSOR	SOLOY 02-680R2
CF	<u>CF-2000-13</u>	COLLECTIVE LEVER - RAISED FORGING BOSS	ASB 206-00-93
CF	<u>CF-98-43</u>	CROSSTUBE ASSEMBLIES	
CF	<u>CF-98-27</u>	TAILBOOM MODIFICATION	ASB 206L-87-47 REV C
CF	<u>CF-98-15</u>	EXTERNAL RESCUE SYSTEMS	CAR 702.21
CF	<u>CF-1998-42R4</u>	CRACKED TAIL BOOM SKIN	206L-99-115 REV E
CF	<u>CF-97-03</u>	MAST AND TRUNNION RETIREMENT LIFE	
CF	<u>CF-96-11</u>	FUEL CELL VENT TUBE - WATER INGESTION	206-95-156
CF	<u>CF-95-19</u>	TEMP-PLATES OVERHEAT INDICATORS	ASB 206L-93-91 REV B
CF	<u>CF-95-17</u>	CROSSTUBE FAILURES	AA-ASB 94045/94046
CF	<u>CF-95-11R2</u>	UNAPPROVED BOLTS, FLIGHT CONTROL SERVO ACTUATORS	206-67-02,206-67A-01
US	<u>95-09-06</u>	INADVERTANT FUEL VALVE SWITCH POSITIONING	206-90-54/206L-90-67
US	<u>94-24-11</u>	TAIL ROTOR DRIVESHAFT MISALIGNMENT	206-92-69/206L-92-84
US	<u>94-20-03</u>	MAIN ROTOR HUB TRUNNION	206L-93-90
US	<u>94-19-02</u>	SWASHPLATE SUPPORT ASSEMBLY	206-93-74 REV B
US	<u>94-15-07</u>	MAIN ROTOR BLADES CRACKS	ASB 206-93-77
US	<u>92-06-12</u>	MAIN TRANSMISSION SUNGEAR	206-90-56,206L-90-69
US	<u>92-01-05</u>	MAIN ROTOR BLADES (FALSIFIED COMPONENT RECORDS)	
US	<u>91-23-15</u>	ENGINE RPM SENSOR	SOLOY 02-680
US	<u>91-03-12</u>	EMERGENCY FLOAT BAGS	206L-89-63,206-89-49
US	<u>90-21-03</u>	TAIL ROTOR BLADE TIP WEIGHT	
US	<u>90-13-01R1</u>	TAIL ROTOR BLADES	
US	<u>89-22-01R1</u>	MAIN ROTOR BLADES	
US	<u>89-20-13</u>	HORIZONTAL STABILIZER	
US	<u>88-26-03</u>	FUEL SYSTEM FLOW SWITCHES	206L-88-52
US	<u>88-23-03</u>	TAIL ROTOR YOKE ASSEMBLY	
US	<u>87-10-11</u>	MAIN ROTOR MAST	206-87-37, -44
US	<u>86-24-01</u>	TAIL ROTOR YOKE	
US	<u>85-26-06</u>	TAIL ROTOR BLADES	
US	<u>85-25-01</u>	CYCLIC CONTROL STICK	206-85-29,206L-85-36
US	<u>85-09-04</u>	MAIN ROTOR BLADES	ASB 206L-85-35
US	<u>83-03-04</u>	CHECK OF SHEAR HEADS-FLOAT INFLATION VALVES	SB 206L-81-21
US	<u>82-16-12</u>	WITH CHADWICK C-22 AFS PER STC SH139W	CHADWICK SB 20-81-01
US	<u>82-05-03</u>	HORIZONTAL STABILIZER ASSEMBLY	ASB 206L-81-23 REV A
US	<u>80-18-04R1</u>	MAIN ROTOR TRUNNION	ASB 206L-80-9 REV A
US	<u>80-17-05</u>	TAIL ROTOR BLADES	
US	<u>78-24-06R1</u>	HORIZONTAL STABILIZER	
US	<u>78-11-02R1</u>	M/R BLADE STRAPS	
US	<u>76-14-05</u>	FUEL SYSTEM COMPONENTS	

CF-95-17 BELL

Applies to all models of Bell 206 series helicopters equipped with the following crosstube assemblies (crosstubes):

- (i) Aeronautical Accessories Inc. P/N
 - 206-320-101 and -102
 - 206-321-001 and -002
 - 206-323-*
 - 206-325-*
 - 206-328-*
 - 206-329-001 and -002
- (ii) Airborne Supply Inc. P/N
 - AB206-050-107 and -119*
 - AB206-053-109*
- (iii) Bell Helicopter Textron P/N
 - 206-050-107, -119, -134, -157 and 169*
 - 206-053-109, -119 and -129*

(iv) Other manufacturers, as approved by the P/N Any of the above

Federal Aviation Administration (FAA)

under Parts Manufacturer Approval (PMA)

*All dash numbers

Compliance is required as indicated.

Two accidents have been attributed to crosstube failures. There has also been a number of reports of cracks due to corrosion or metal fatigue that might cause a failure of the crosstubes. On the crosstubes of older design, the cracks were mostly found at the rivet holes in the attachment-to-fuselage area and at the saddle attachment. On the newer, clamp-on tubes without holes, the cracks were mostly found in the saddle attachment area and along the line where the clamp touches the tube. Helicopters operating in a corrosive environment, or being used in a training or sightseeing role involving frequent landings are most affected.

To prevent failure of the affected crosstubes accomplish either Part I or Part II below, depending on the type of crosstube:

Part I For Aeronautical Accessories Inc. Crosstubes

A. For Model 206A and 206B Helicopters:

1. Initially, within the next 100 hours time-in-service, unless already accomplished, perform an inspection as per Aeronautical Accessories Inc. Alert Service Bulletin (ASB) No. 94045, Revision B dated 17 April 1995.
2. Not later than 1 February 1996, incorporate into the operator's aircraft inspection program the procedures of Report No. AA-94022, Revision G or later revision, as referenced in ASB No. 94045, Revision B. The required procedures shall be repeated at each annual or 300-hour scheduled inspection, whichever comes first.

B. For Model 206L, 206L-1, -3 and -4 Helicopters:

1. Initially, within the next 100 hours time-in-service, unless already accomplished, perform an inspection as per Aeronautical Accessories Inc. ASB No. 94046, Revision B dated 17 April 1995.
2. Not later than 1 February 1996, incorporate into the operator's aircraft inspection program the procedures of Report No. AA-94023, Revision D or later revision, as referenced in ASB No. 94046, Revision B. The required procedures shall be repeated at each annual or 300-hour scheduled inspection, whichever comes first.

Part II For All Other Affected Crosstubes

1. Initially, within the next 100 hours time in service, perform a detailed visual inspection of the crosstubes for cracks and corrosion, using a 10-power magnifying glass. Pay particular attention in the strap and the saddle attachment area for mechanical damage and corrosion which could lead to cracks. If there is any indication of cracks or corrosion, remove the paint in suspected areas and perform the detailed visual inspection. If the crosstube has rivet holes in the attachment-to-fuselage area, visually check using a 10-power magnifying glass for cracks emanating from the rivets holes. Refer to the applicable Maintenance Manual for inspection limits. In the absence of manufacturer's limits, the maximum allowable depth of corrosion is limited to 0.005 inch over an area not exceeding one-fourth the circumference by 3 inches in length after cleanup, regardless of location. If any crosstube is found corroded beyond the maximum allowable limit, or cracked, replace the part with a serviceable one before further flight.

2. Not later than 1 February 1996, incorporate the requirements of paragraph 1 above in the operator's aircraft inspection program. The required inspection shall be repeated at each annual or 300-hour scheduled inspection, whichever comes first.

Note: The amendments to the aircraft inspection program, required by Parts I and II above, eliminate the requirement to record in the aircraft records the intervals of this directive and the repeat certification of accomplishment in accordance with Airworthiness Manual Chapter 575.

This inspection task insertion is to include the following:

"AD CF-95-17 refers. This task is not to be escalated or removed from the inspection program without approval by Transport Canada, Chief Continuing Airworthiness, Ottawa."

Replacement of affected crosstubes with later part number crosstubes constitutes terminating action for the inspection requirements of this directive.

Alternative means of compliance with the requirements of this directive may be used only if approved by the Director, Airworthiness Branch, Transport Canada, Ottawa. Any application should be made to the appropriate regional office.

This airworthiness directive (AD) supersedes Federal Aviation Administration (FAA) AD 95-11-14. It also supersedes Transport Canada Alleviation No. AARDG 95/A90, issued to operators of Canadian registered Bell 206 helicopters on 16 June 1995.

This directive becomes effective 9 January 1996.

CF-98-43 BELL

Applies to all Bell Helicopter Textron Canada (BHTC) Model 206 series helicopters equipped with crosstube assemblies (crosstubes) of older design having rivet holes in the support area designated for rivet-on supports with the following, but not limited to, part numbers:

- (i) Aeronautical Accessories Inc. 206-321-001 and -002
- (ii) Airborne Supply Inc. AB206-050-107-025 and -027
 AB206-050-119-005 and -007
- (iii) Bell Helicopter 206-050-107-011, -013, -025 and -027
 206-050-119-001, -003, -005 and -007
 206-050-134-001, -003, -005, -007, -009 and -011
 206-050-169-001, -003, -011 and -013
 206-053-109-001, -003, -005 and -007
 206-053-119-001 and -003
 206-053-129-009, -011, -101 and -103
- (iv) Other manufacturers, as approved by Any of the above the Federal Aviation
Administration (FAA) under Parts Manufacturer Approval (PMA)

Note: The riveted crosstubes of newer configurations, P/N 206-050-2xx-xxx and 206-053-2xx-xxx, having rivet holes only on the sides of the crosstube, are not affected by this directive.

Compliance is required as indicated, unless already accomplished.

The older versions of riveted crosstubes were subject to fatigue cracking; the large majority of cracks started at the top rivet holes under the support assemblies. A few started elsewhere at corrosion or mechanically damaged initiation points. Two accidents have been attributed to crosstubes breaking from cracks starting at the rivet holes. Since the issue of Airworthiness Directive CF-95-17, which introduced inspections, a total failure of an aft crosstube occurred just 40 hours air time after it was properly inspected. The crack had gone undetected under the strap assembly until progressing rapidly once near the strap's edge. Therefore, these older riveted configurations need to be retired within a reasonable time in service.

To prevent a possible catastrophic failure of the crosstube assemblies accomplish the following:

1. Within the next 100 hours air time after the effective date of this directive, remove from the helicopter any crosstube of unknown history or having a total of six or more years in service.
2. No later than 31 December 2000, remove any of the affected crosstubes, regardless of time in service.

This directive becomes effective 15 February 1999.

APPENDIX B

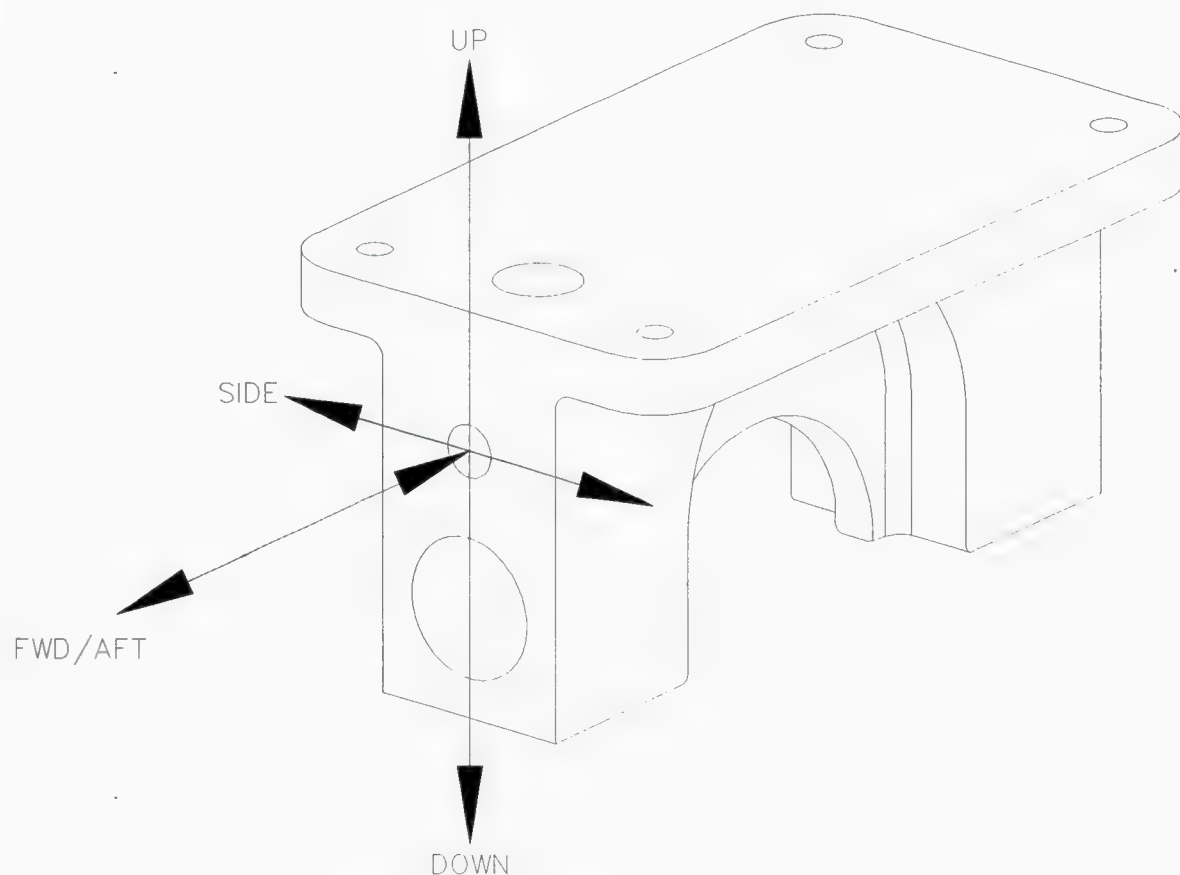
DIAGRAMS OF ALLOWABLE LOAD LIMITATIONS

DESIGN ALLOWABLE LOADS EXTERNAL ATTACHMENT PROVISIONS

THE FOLLOWING CONDITIONS
MUST BE MET TO ACHIEVE
THE LOADS SHOWN HERE:

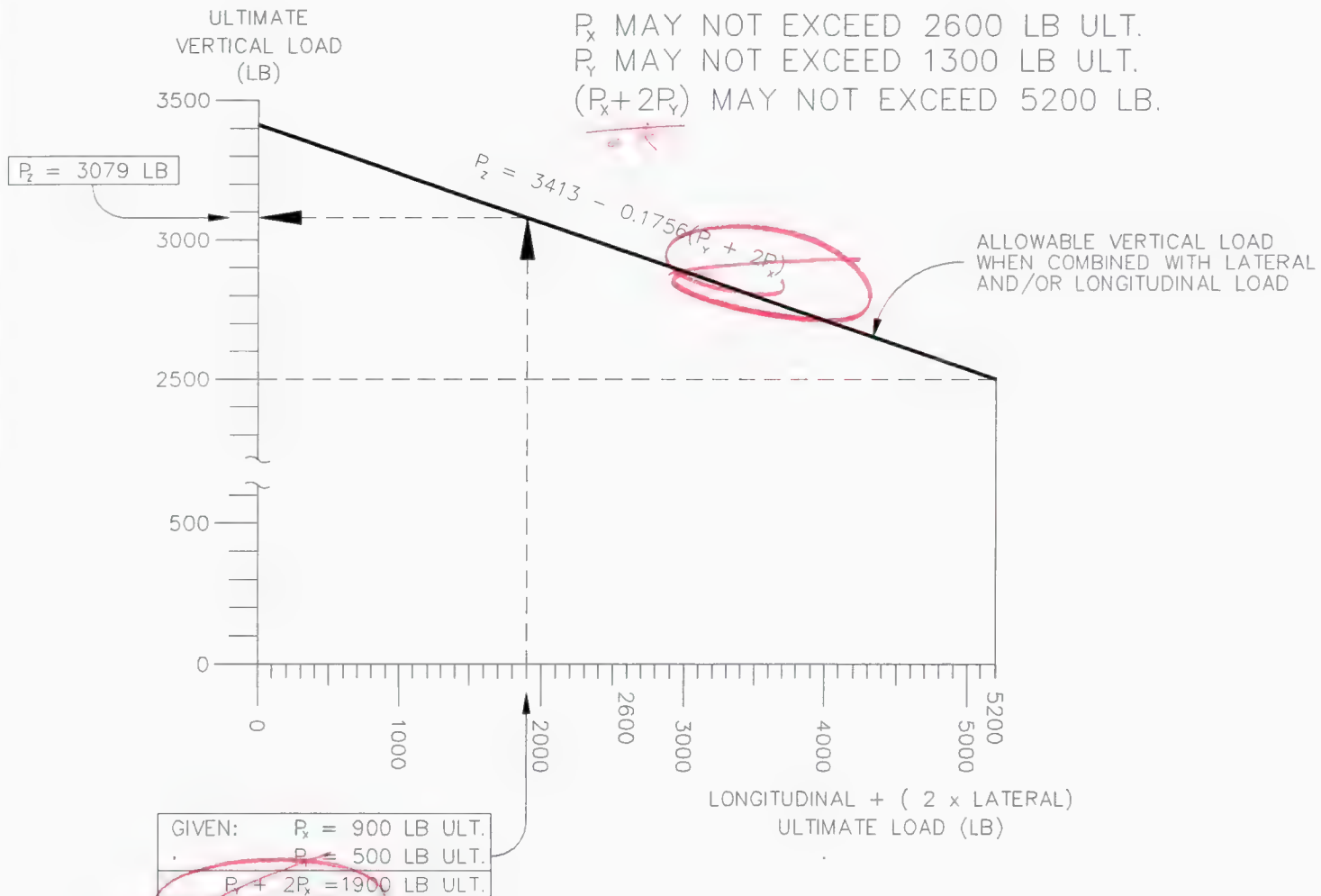
- AN6 BOLT INSTALLED
- FULL THREAD ENGAGEMENT
- AN6 BOLT TORQUED TO
90 TO 110 INCH-POUNDS
- AN4 BOLTS TORQUED TO
70 TO 90 INCH-POUNDS

DIRECTION	LIMIT (POUNDS)	ULTIMATE (POUNDS)
UP/DOWN	1978	3413
FWD/AFT	1507	2600
SIDE	754	1300



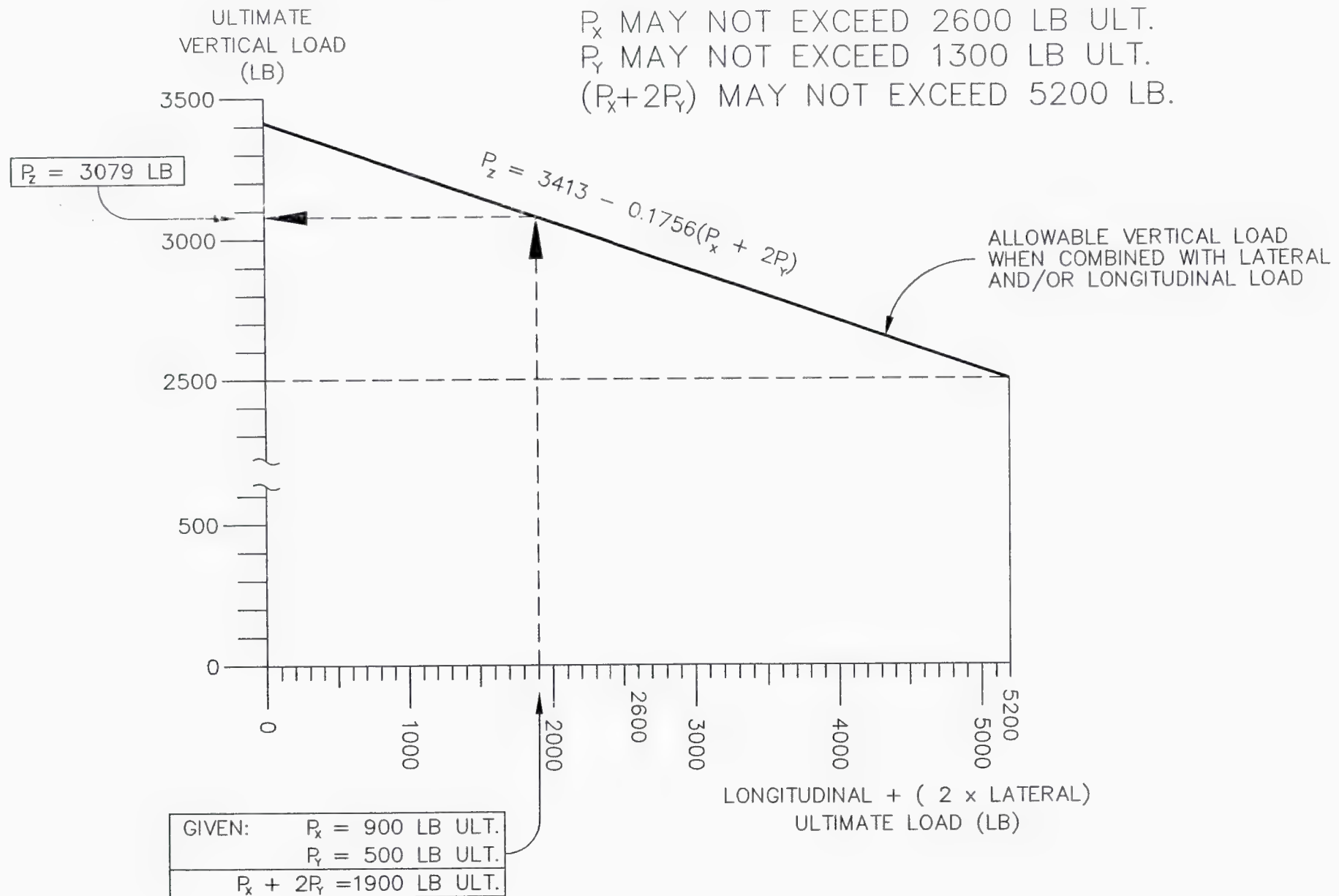
DESIGN ALLOWABLE ULTIMATE VERTICAL LOAD WHEN COMBINED WITH LONGITUDINAL AND LATERAL LOADS

EXAMPLE: IF A GIVEN INSTALLATION APPLIES 900 LB OF DRAG ULTIMATE LOAD, AND 500 POUNDS OF SIDE ULTIMATE LOAD, THEN UP TO 3079 POUNDS OF VERTICAL ULTIMATE LOAD IS PERMITTED.



DESIGN ALLOWABLE ULTIMATE VERTICAL LOAD WHEN COMBINED WITH LONGITUDINAL AND LATERAL LOADS

EXAMPLE: IF A GIVEN INSTALLATION APPLIES 900 LB OF DRAG ULTIMATE LOAD, AND 500 POUNDS OF SIDE ULTIMATE LOAD, THEN UP TO 3079 POUNDS OF VERTICAL ULTIMATE LOAD IS PERMITTED.



AERO DESIGN LTD.

1045 McTavish Rd. N.E.
Calgary, Alberta
T2E 7G9

2 May, 2001

Transport Canada
Aircraft Certification Division
Edmonton Aircraft Certification Office
11th Floor, Canada Place
9700 Jasper Avenue
Edmonton, Alberta
T5J 4E6

Attn: Mr. Jack Staal

Re: Installation of External Mounting Provisions on Bell 206L

Out file: 493
Your file: n/a

Jack:

This project has been discussed with Greg in the past, and is part and parcel with what he has already given you regarding the baskets. Where SH00-48, Issue 1 remains strictly for the Bell 407, the Issues 2 and 3 can be for the provisions installation and basket installation, respectively.

Enclosed are the following documents:

Modification Approval Request Application Form	MOD493	Rev. 0
Compliance Program	CP493	Rev. 1
Project Summary	PS493	Rev. 0

We have already discussed the Compliance Program with Greg, and he seems satisfied at this point. The Engineering Report and drawings will follow soon.

Regards,



S. Fahey, Technologist

Encl.

Job 493

PS, 493 Rev. 0

12 March, 2002

External Attachment Provisions

Type and Model: Bell 206L series

Project Summary

Convenient provisions are required for mounting a cargo basket to the bottom of the Bell light helicopter. Provisions are installed which simplify the installation of the basket.

Approval: LSTC

Customer: Aero Design Ltd.

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

APPLICANT: AERO Design Ltd.
1045 McTavish Rd. N.E.
Calgary, Alberta, T2E 7G9

DATE: 12 March, 2002
REV. No. 1 4 April, 2002

CORRESPONDANCE TO:
(If other than applicant)

MAKE: Bell Helicopter
MODEL: 206B, 206L, 206L-1, 206L-3, 206L-4

REGISTRATION: All Applicable
SERIAL No.: All Applicable

NATURE OF WORK: Installation of External Attachment Provisions

MODEL CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.
MODIFICATION CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.

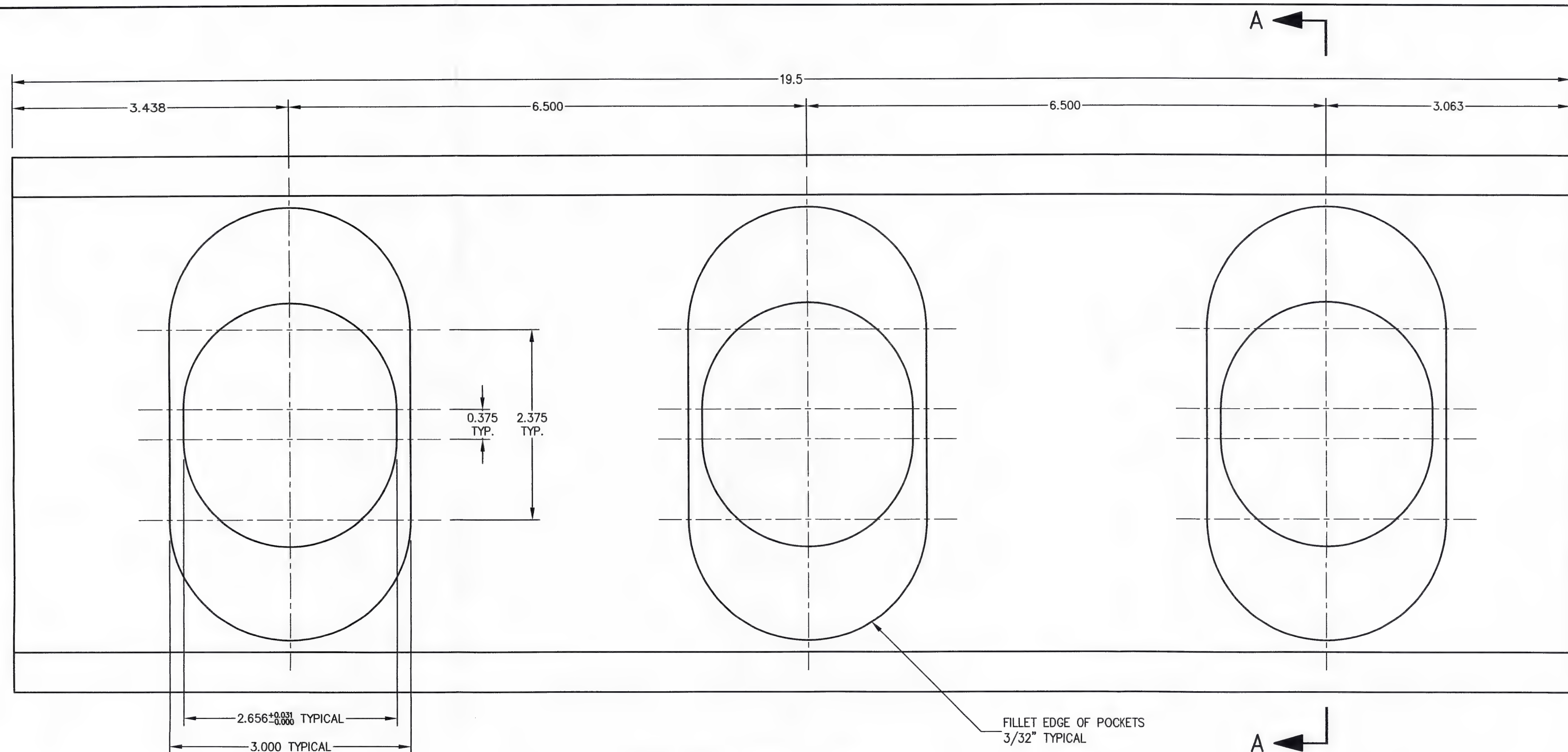
Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
Paragraph	Amdt.				
Subpart B – Flight					
27.29	24 Empty Weight and Corresponding C of G	Data specified on inst'n drawing		X	
Subpart C – Strength Requirements					
27.301	24 Loads	Compliance with 23.471, 23.473, 23.337 and 23.561		X	
27.303	24 Factor of Safety	Analysis		X	
27.305	24 Strength and Deformation	Analysis		X	
27.307	28 Proof of Structure	Analysis		X	a) Original load path unaffected, as shown by comparison of material strengths. b) Provision load path analyzed to establish design allowable loads.
27.337	28 Limit Maneuvering Load Factor	Analysis		X	Limit maneuvering load factor to be applied in analysis to demonstrate vertical capacity of external attachment

Airworthiness Requirement	Subject for Compliance or Documentary Proof		Form of Substantiation	DOT	DAR	Comments
27.471	24	Ground Loads – General	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.473	24	Ground loading conditions and assumptions	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
Paragraph	Amdt.					
27.501	28	Ground Loading Conditions – Landing Gear with Skids	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.561	24	Emergency Landing Conditions	Analysis		X	Ultimate manoeuvring load factor exceeds downward emergency landing load factor.
27.571	28	Fatigue Evaluation of Flight Structure	Analysis	X		Provision fastener joint only.
Subpart D – Design and Construction						
27.601	24	Design	Drawings		X	Design is conventional.
27.603	24	Materials	Drawings		X	Materials used are specified in Mil-Hdbk-5H.
27.605	24	Fabrication Methods	Drawings		X	Design is conventional.
27.609	24	Protection of Structure	Drawings		X	
27.611	24	Inspection Provisions	Drawings		X	Design is easy to inspect.
27.613	28	Material Strength Properties and Design Values	Values used as per Mil-Hdbk-5H		X	
27.625	24	Fitting Factor	Analysis		X	
27.725	24	Limit Drop Test	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.727	28	Reserve Energy Absorbtion Drop Test	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.865	28	External Load Attaching Means	N/A	X		Provision only: Consideration required for approval of equipment attached to provision.

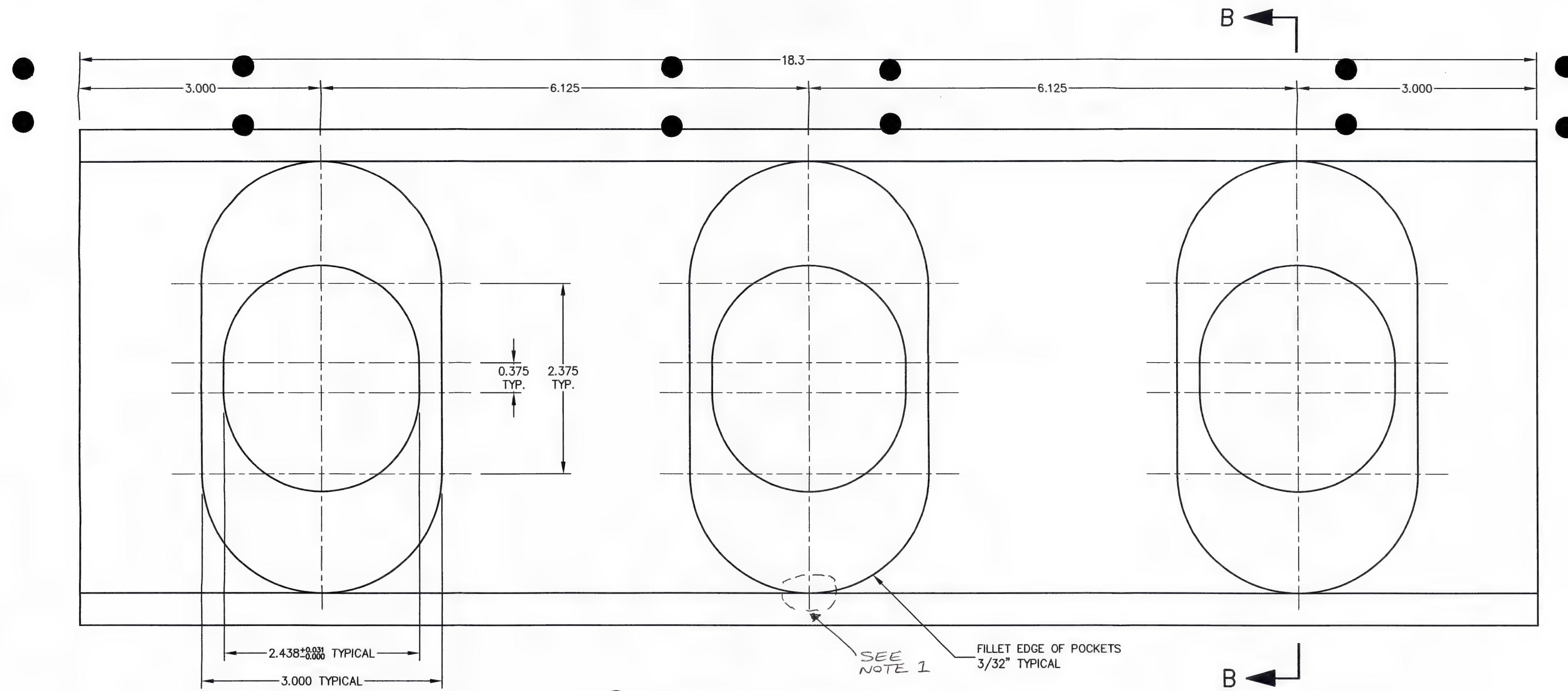
MODIFICATION APPROVAL REQUEST APPLICATION FORM

MOD493, Rev: 0

1. NAME AND ADDRESS OF APPLICANT: AERO Design Ltd. 1045 McTavish Rd. N.E. Calgary, AB, T2E 7G9		2. IDENTIFICATION OF PRODUCT				
		MAKE: Bell Helicopter	MODEL: 206L, 206L-1, 206L-3, 206L-4			
ALL CORRESPONDANCE TO: AERO Design Ltd. 1045 McTavish Rd. N.E. Calgary, AB, T2E 7G9		SERIAL No.:	REGISTRATION:			
3. REQUEST FOR:						
A. SUPPLEMENTAL TYPE CERTIFICATE (STC)		<input type="checkbox"/>				
B. STC/STA REVISION		<input checked="" type="checkbox"/> STC/STA No. SH00-48				
C. LIMITED SUPPLEMENTAL TYPE CERTIFICATE (LSTC)		<input type="checkbox"/>				
D. LIMITED STC/STA REVISION		<input type="checkbox"/> LSTC/LSTA No.				
E. F.A.A. SUPPLEMENTAL TYPE CERTIFICATE		<input type="checkbox"/>				
F. F.A.A. STC REVISION		<input type="checkbox"/> STC No.				
G. FAMILIARIZATION OF F.A.A. STC		<input type="checkbox"/> STC No.				
H. REPAIR DESIGN APPROVAL (RDC)		<input type="checkbox"/>				
I. PARTS DESIGN APPROVAL (PDA)		<input type="checkbox"/>				
4. TITLE OF MODIFICATION OR REPAIR: Installation of External Attachment Provisions						
5. BRIEF DESCRIPTION OF MODIFICATION OR REPAIR: Provisions for mounting external cargo basket are installed on helicopter.						
6. APPLICABLE TYPE APPROVAL (TA) OR TYPE CERTIFICATE (TC) DOCUMENTS:						
A. TA NO. H-92 B. TC No. C. OTHER						
7. PROPOSED BASIS OF APPROVAL:						
A. SAME AS TA <input checked="" type="checkbox"/> B. SAME AS TC <input type="checkbox"/> C. OTHER <input type="checkbox"/> (Please specify)						
8. DOCUMENTATION CHECKLIST		REQUIRED		FOR DOT USE ONLY		
		YES	NO	RECEIVED		
		YES	NO	YES	NO	DATE
COMPLIANCE PROGRAM		X				
MASTER DRAWING LIST		X				
FLIGHT MANUAL SUPPLEMENT			X			
MAINTENANCE MANUAL SUPPLEMENT		X				
INSTRUCTIONS FOR CONTINUING AIRWORTHINESS			X			
ENGINEERING REPORTS		X				
DESIGN DRAWINGS			X			
MANUFACTURE DRAWINGS & INSTALLATION INSTRUCTIONS		X				
ELECTRICAL LOAD ANALYSIS			X			
DRAFT STC, LSTC OR RDA			X			
WEIGHT AND MOMENT CHANGE			X			
FLIGHT TEST DATA			X			
OTHER (Specify)						
9. APPLICANT'S REMARKS:						
10. In addition to the payment of Aircraft Certification approval fees as prescribed in Canadian Aviation Regulations (CAR) Section 104, I agree to reimburse Transport Canada incremental expenses as in Aviation Regulation Directive No. 3, or equivalent, as applicable. For further details governing cost recovery, refer to AMA 513/4.						
PER: <u>S. FATEH</u>		FOR <u>E. BURGAIN</u>		12 March, 2002		
SIGNATURE OF APPLICANTS		TITLE		DATE		
11.						
SIGNATURE OF REGIONAL ENGINEER		DATE				

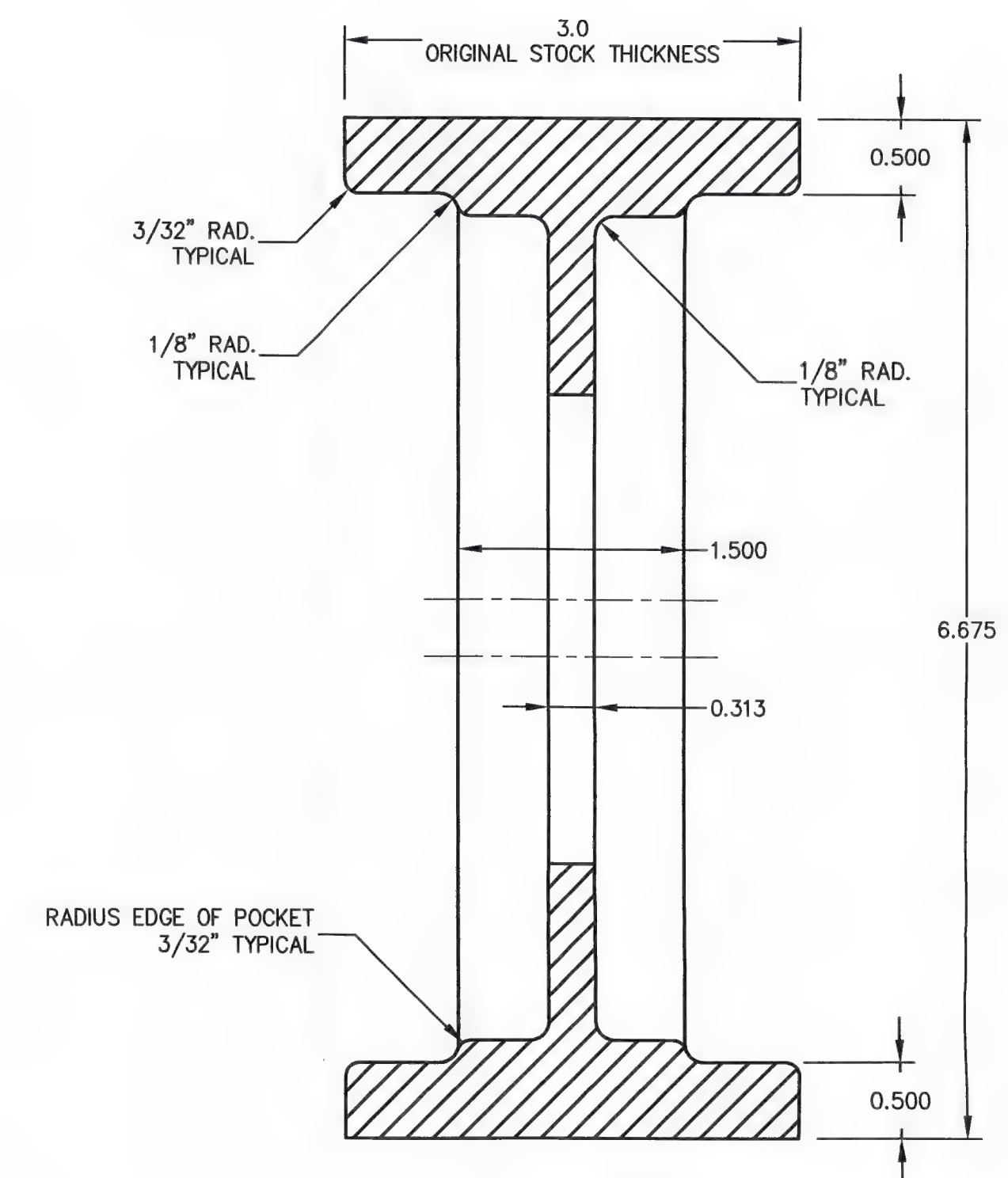


02 AFT FITTING HOG-OUT

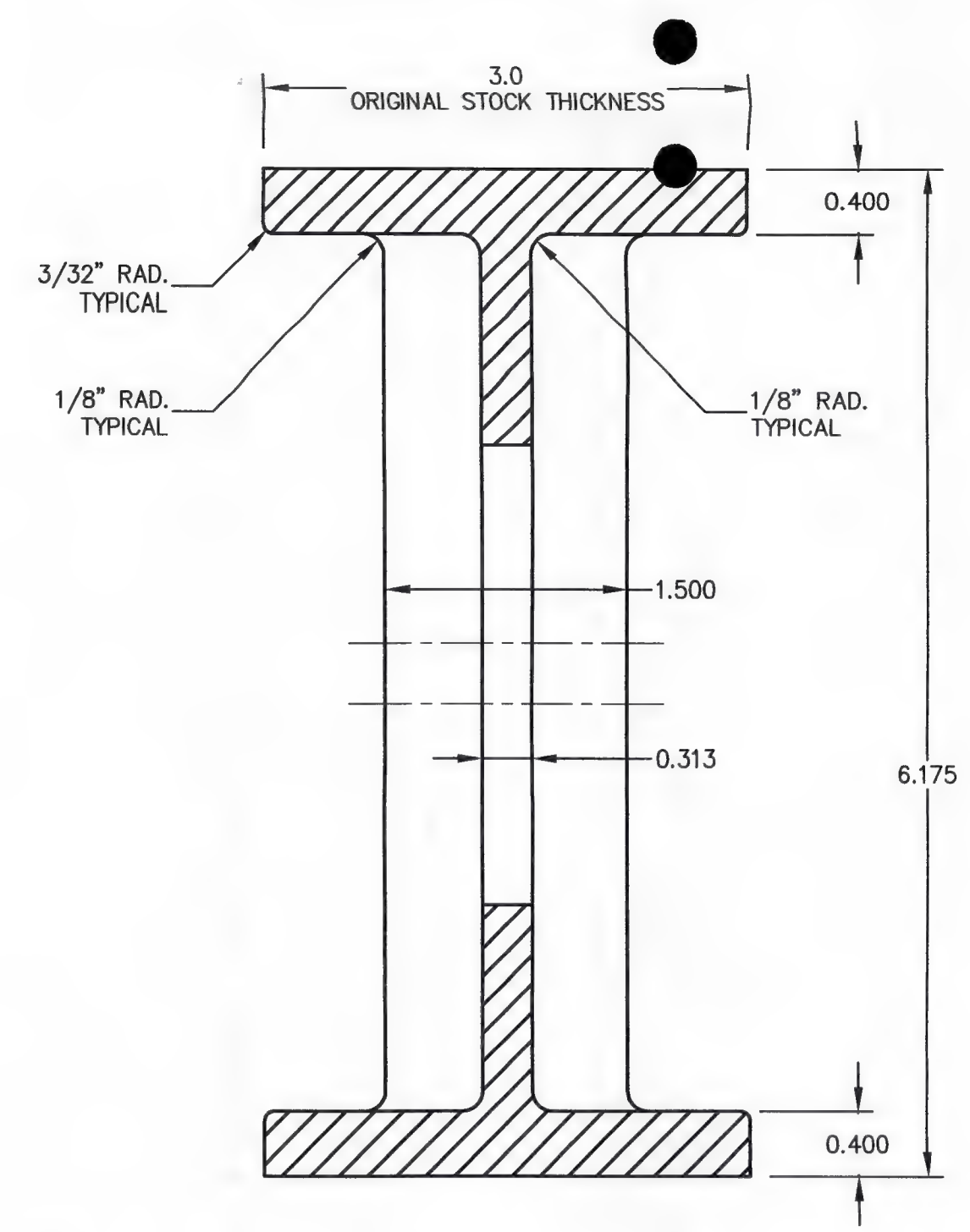


01 FORWARD FITTING HOG-OUT

NOTE 1: STOP RADIUS OF POCKET PRIOR TO CONTACT WITH FLANGES.



SECTION A-A



1	49360-02	02	AFT FITTING HOG-OUT	6061-T651 ALUMINUM	QQ-A-250-11	3.0" PLATE
1	49360-01	01	FORWARD FITTING HOG-OUT	6061-T651 ALUMINUM	QQ-A-250-11	3.0" PLATE
01	PART NO.	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
QTY.	LIST OF MATERIALS					
<div>APPROVALS</div>			<div>DATE</div>			<div>AERO DESIGN LTD.</div> <div>ENGINEERING CONSULTANTS</div> <div>1045 McTAVISH ROAD N.E.</div> <div>CALGARY, ALBERTA T2E 7G9</div>
<div>DRAWN: S. FAHEY</div>			<div>MAY 02/02</div>			
<div>CHECKED: E. BURGAIN</div>			<div>MAY 02/02</div>			
<div>STRESS:</div>						
<div>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON:</div>			<div>BELL 206L</div> <div>EXTERNAL ATTACHMENT PROVISIONS</div> <div>FITTINGS HOG-OUT</div>			
<div>DECIMALS</div> <div>X.XXX ±0.010</div> <div>X.XX ±0.03</div> <div>X.X ±0.1</div>			<div>ANGLES</div> <div>±1/2"</div>			
<div>SCALE 1 : 1</div>		<div>DWG. SIZE</div> <div>A1</div>	<div>DWG. NO.</div> <div>49360</div>		<div>REV.</div> <div>0</div>	
<div>SHEET 1 OF 1</div>						

NOTICE			
THIS DRAWING CONTAINS INFORMATION AND DATA WHICH IS PROPRIETARY TO AERO DESIGN LTD. THIS DRAWING, OR ANY PORTION THEREOF, MAY NOT BE REPRODUCED, COPIED, OR DUPLICATED IN ANY MANNER, NOR USED FOR MANUFACTURING WITHOUT THE WRITTEN CONSENT OF AERO DESIGN LTD. BY ACCEPTING THIS DRAWING FOR REFERENCE, THE RECIPIENT AGREES TO HOLD AERO DESIGN LTD. HARMLESS FROM THE USE, OR MISUSE, OF THIS DRAWING OR THE INFORMATION CONTAINED THEREON.			
REV.	DESCRIPTION OF CHANGE	INITIALS	DATE
1			

1941 AM

RELEASED

400 278 5380

**A.C.T. EQUIPMENT SALES LTD.****Fax Transmittal Form****To:** TED or STEPHEN**From:** David Gardiner**Company Name:** AERO-DESIGN**ACT Equipment Sales Ltd.****Fax Number:** 250-8333**Phone:** 403-279-6016**Fax:** 403-279-5390**Email:** davidgardiner@actequipment.com

- ☐ Urgent
☒ For Review
☐ Please comment
☐ Please Reply

Date sent: APR. 25/02.**Time sent:** 10:30.**Number of pages including cover page:** 1

AS PER YOU REQUEST.

#90-7.9/16.7-CS9.5

\$525.00 NET.

DELIVERY WOULD BE 2-3 WKS.

ORDERED APRIL 25 ON ACCT.

EXPECT DEL. BY MAY 16?

PER OUR
DISCUSSION

E. BURGOW

THANKS
DAVID

**A.C.T. EQUIPMENT SALES LTD.****Fax Transmittal Form**To: TED OR STEPHEN

From: David Gardiner

Company Name: AERO-DESIGN

ACT Equipment Sales Ltd.

Fax Number: 250-8333

Phone: 403-279-6016

Fax: 403-279-5390

Email: davidgardiner@actequipment.com

☐ Urgent☒ For Review☐ Please comment☐ Please ReplyDate sent: APR-25/02Time sent: 10:30Number of pages including cover page: 1

AS PER YOU REQUEST.

#90-7.9/16.7-CS9.5

\$525.00 NET.

DELIVERY WOULD BE 2-3 WKS.

ORDERED APRIL 25 IN ACT
MAY 16?

THANKS

DAVID

**A.C.T. EQUIPMENT SALES LTD.****Fax Transmittal Form**To: Ted

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Company Name:

ACT Equipment Sales Ltd.

Fax Number: 250-8333.

Phone: 403-279-6016

Fax: 403-279-5390

Email: davidgardiner@actequipment.com

☐ Urgent☒ For Review☐ Please comment☐ Please ReplyDate sent: Apr-25/02.Time sent: 8:25.Number of pages including cover page: 4

Ted,

HERE IS A LITTLE INFO ON THE
BACKSPOT FACERS AVAILABLE TO ME.

DAVID.

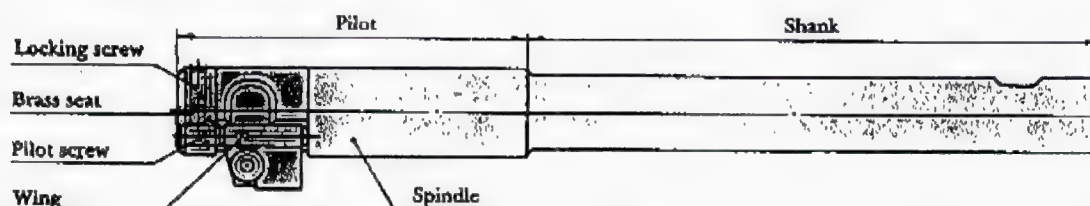
INDEX

Back spotfacing.....	4-10	Wings, various types	11
Part numbering system.....	7	Weldon	10
Back chamfering 45°, 60°, 30°	12-15	Semistandard and Special tools	18
"A few hints ..."	13	Coolant through	18
Front and Back spotfacing	16	Spare parts	19
Front and Back chamfering 45°	17		

TECHNICAL DESCRIPTION

Patented Design. Reliable Performance. The Erix tool is an automatic back spotfacing or back chamfering tool consisting of a spindle and a cutter, called a Wing, which folds into the spindle recess when the tool enters the hole in the workpiece. Excellent performance is ensured because there is only one moving part.

Save time and money. Working time saved when compared with conventional methods is normally between 60 and 70%, in some cases more than 90%.



SPINDLE. The pilot part of the spindle guides the spotfacer into the hole and takes up the cutting forces.

The pilot diameter is less than the nominal hole diameter.

The difference in diameter is as follows:

Spindle Size	Pilot Diameter
.188- .375	.002
.406- .500	.004
.531- .969	.008
1.000- 1.156	.012

Spindles size 1.188" and above have a pilot diameter which is .039" less than the hole dia-

meter. These spindles are provided with wear strips, which guide the spotfacer into the hole. All spindles have cylindrical shanks.

WING. During operation the wing must be free to swing. Therefore, when assembling a wing, the pivot screw should be released about 30 degrees.

Smaller wings are made of HSS (high speed steel) with integral cutting edges. Larger size wings have square inserts type SPU or rectangular inserts type ISO/R242.

The inserts are clamped to the wings by means of Secodex lefthand threaded screws.

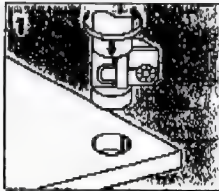


Ordinary back spotfacing (90°).

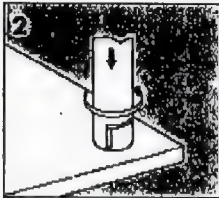


Spindle with coolant through (CT).

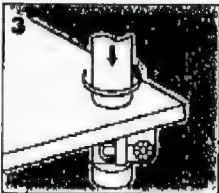
HOW THE ERIX TOOL OPERATES



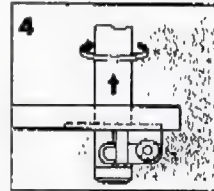
Counterclockwise rotation at recommended speed: rapid feed until the wing is a few thousandths from the workpiece.



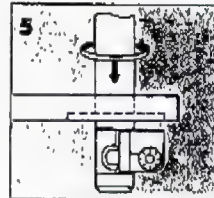
Counterclockwise rotation: feedrate reduced to .008" per rev. until the wing has folded into the spindle recess.



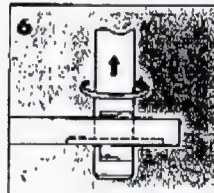
Counterclockwise rotation: rapid feed forward until the entire length of the wing swings completely free.



Reverse to clockwise rotation: cutting operation with feedrate according to recommendations in "Guidelines".



After spotfacing back the tool away until the wing swings completely free. Reverse again to counterclockwise rotation.



Counterclockwise rotation: reduce feedrate .008" per rev. until the wing has folded into the spindle recess. Then rapid feed back to the starting point.

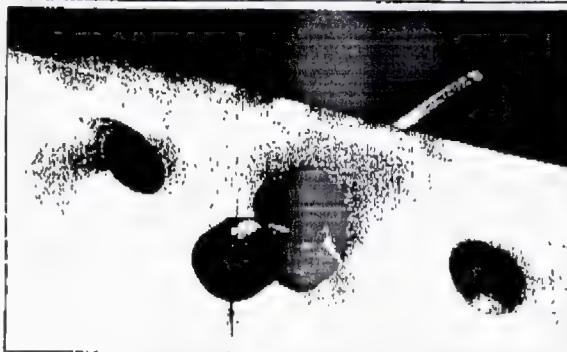
GUIDELINES FOR SPEED AND FEED

Material	Spindle/Tooling (inches)	Approximate spindle speed RPM	Cutting feed (inches per rev)	
			in Steel	in Cast Iron
HSS	.313- .438	700	.0010	.0020
	.438- .563	600	.0015	.0025
	.563- .688	500	.0020	.0030
	.688- .813	400	.0025	.0040
	.813- 1.000	350	.0030	.0045
Insert	.875- 1.000	550	.0030	.0045
	1.000- 1.125	470	.0035	.0055
	1.125- 1.375	400	.0045	.0060
	1.375- 1.625	350	.0050	.0070
	1.625- 1.750	310	.0055	.0080
	1.750- 2.000	275	.0060	.0095
	2.000- 2.375	250	.0070	.0105
	2.375- 2.750	225	.0085	.0125
	2.750- 3.250	200	.0095	.0145
	3.250- 4.000	175	.0100	.0160
	4.000- 4.750	160	.0100	.0160
	4.750- 6.000	140	.0100	.0160

IMPORTANT!

When cutting in a fillet (*interrupted cut*) with a horizontal spindle *increase speed* up to 2 times figures given in table and *reduce feed* by 20-30% (spindles .188-1.156" dia only).

When operating the tools for hole size 1.181" and above see also instructions on page 11.



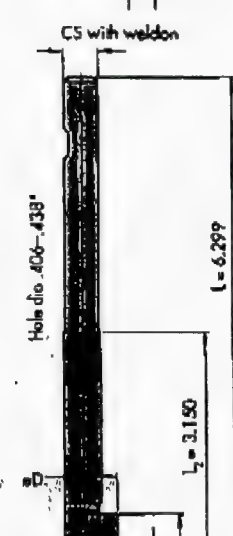
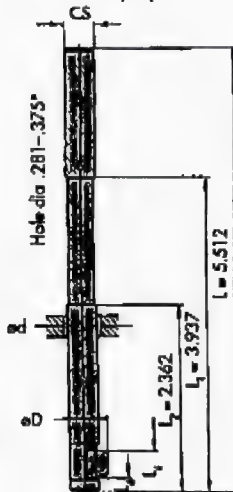
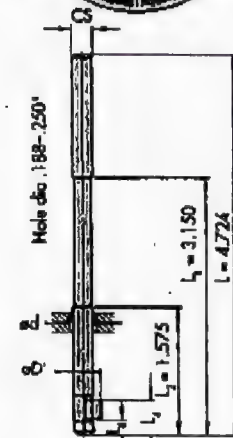
Back chamfering (45°)
(30° and 60° also available).



Front/Back chamfering
(F/B spotfacing also available).

**BACK SPOTFACING**

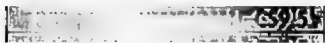
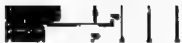
HOLE SIZE .188 - .438"



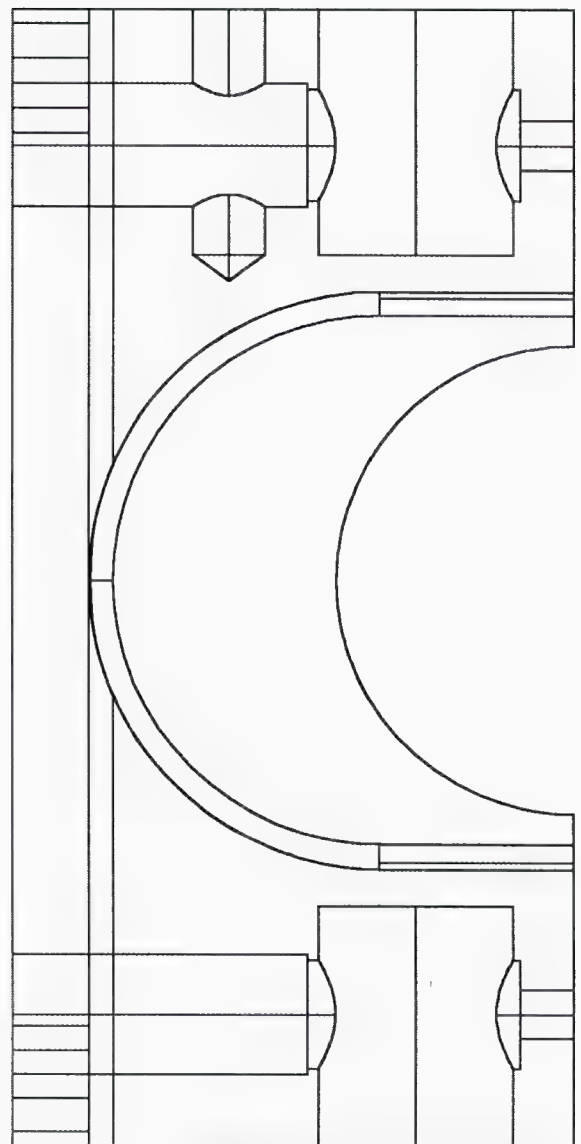
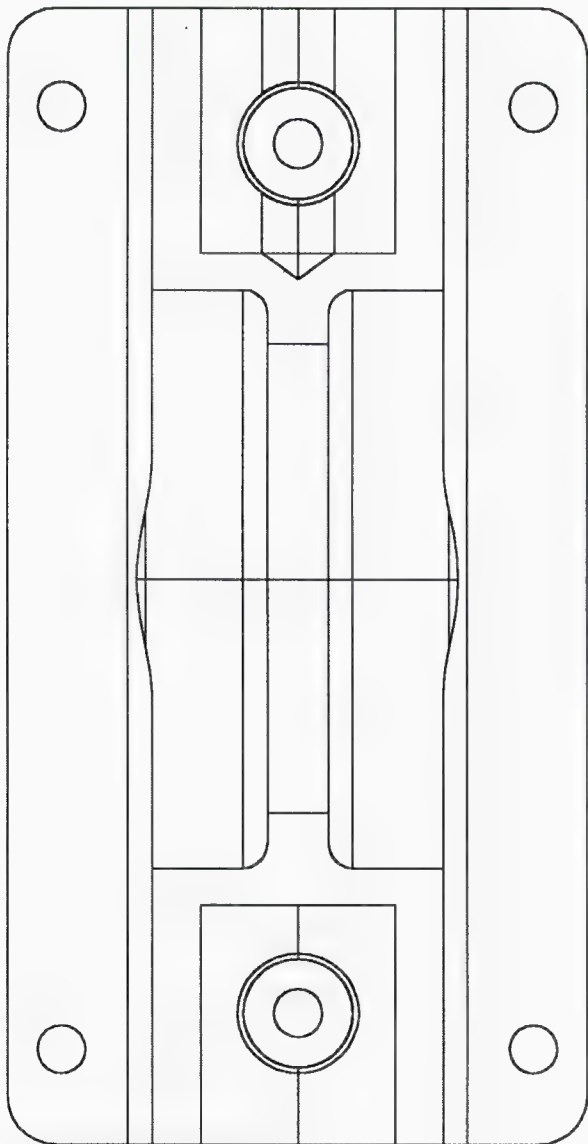
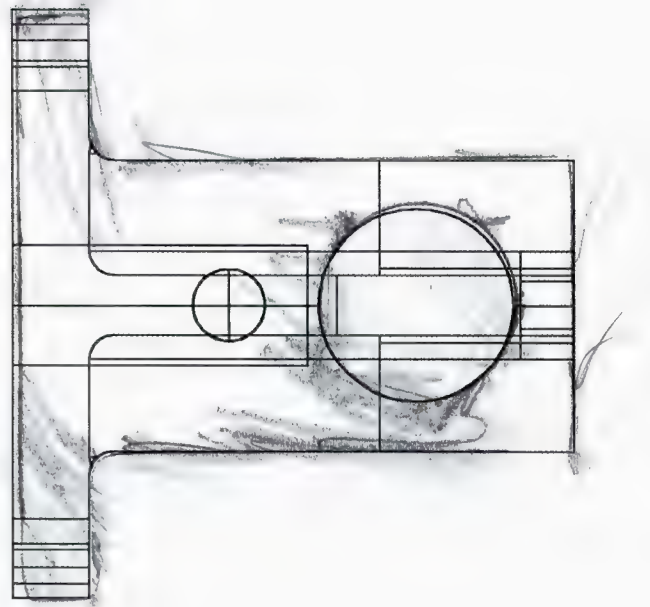
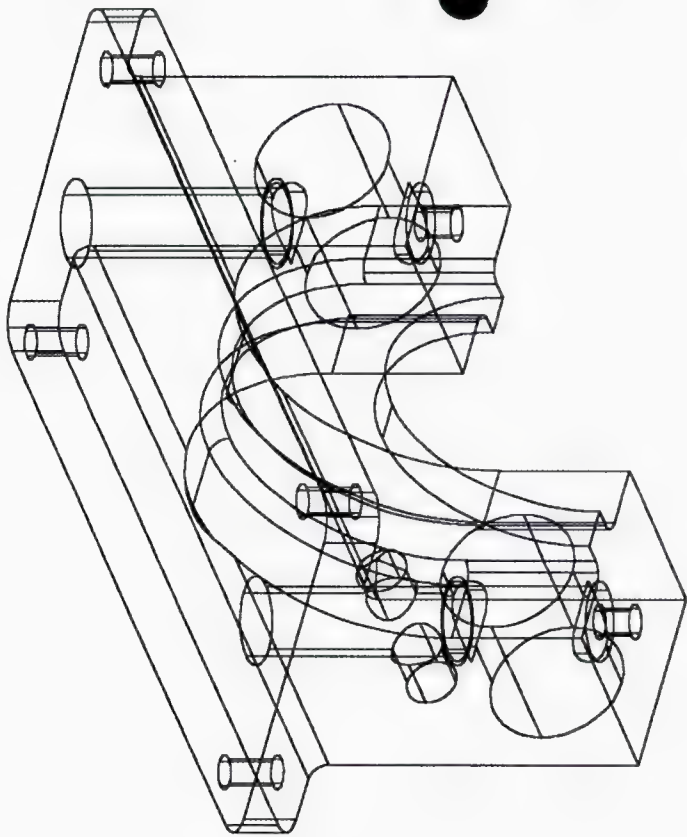
Hole dia	Facing dia	Complete tool	Spindle	Wing	Cutter/Insert	L ₁	L ₂
.188 (3/16)	.323 .350	90-4.75/18.2-CS9.5 90-4.75/18.9-CS9.5	27-4.75-CS9.5	37-011 -010-0335	HSS	.433	.197
.219 (7/32)	.354 .394 .413 .433 .445	90-5.55/18.9-CS9.5 90-5.55/10.0-CS9.5 90-5.55/10.5-CS9.5 90-5.55/11.0-CS9.5 90-5.55/11.5-CS9.5	27-5.55-CS9.5	37-011 -012 -013 -014 -010-0415	HSS	.433	.197
.250 (1/4)	.436 .463 .485 .500	90-6.35/10.3-CS9.5 90-6.35/10.8-CS9.5 90-6.35/11.3-CS9.5 90-6.35/12.7-CS9.5	27-6.35-CS9.5	37-011 -012 -013 -014 -010-0470	HSS	.433	.197

.281 (9/32)	.406 .429 .447 .471 .492	90-7.1/10.3-CS9.5 90-7.1/11.9-CS9.5 90-7.1/13.9-CS9.5 90-7.1/15.9-CS9.5 90-7.1/17.9-CS9.5	27-7.1-CS9.5	37-020-0320 -021 -022 -023 -020-0540	HSS	.591	.197
.313 (5/16)	.500 .529 .562 .595	90-7.9/10.3-CS9.5 90-7.9/11.9-CS9.5 90-7.9/13.9-CS9.5 90-7.9/15.9-CS9.5	27-7.9-CS9.5	37-021 -022 -023 -024 -020-0620	HSS	.591	.197
.344 (11/32)	.625 .654 .687 .720 .753 .786 .819 .852	90-8.7/10.3-CS9.5 90-8.7/11.9-CS9.5 90-8.7/13.9-CS9.5 90-8.7/15.9-CS9.5 90-8.7/17.9-CS9.5 90-8.7/19.9-CS9.5 90-8.7/21.9-CS9.5 90-8.7/23.9-CS9.5	27-8.7-CS9.5	37-020-0380 -021 -022 -020-0540 -024 -025 -020-0680	HSS	.591	.197
.375 (3/8)	.875 .904 .937 .970 1.003	90-9.5/10.3-CS9.5 90-9.5/11.9-CS9.5 90-9.5/13.9-CS9.5 90-9.5/15.9-CS9.5 90-9.5/17.9-CS9.5	27-9.5-CS9.5	37-021 -022 -023 -024 -025 -020-0760	HSS	.591	.197

.406 (13/32)	1.031 1.064 1.097 1.130 1.163 1.196 1.229 1.262	90-10.3/10.3-CS9.5 90-10.3/11.9-CS9.5 90-10.3/13.9-CS9.5 90-10.3/15.9-CS9.5 90-10.3/17.9-CS9.5 90-10.3/19.9-CS9.5 90-10.3/21.9-CS9.5 90-10.3/23.9-CS9.5	27-10.3-CS9.5	37-030-0490 -031 -030-0610 -034 -035 -036 -030-0760	HSS	.945	.394
.438 (7/16)	1.295 1.328 1.361 1.394 1.427 1.460 1.493 1.526	90-11.1/10.3-CS9.5 90-11.1/11.9-CS9.5 90-11.1/13.9-CS9.5 90-11.1/15.9-CS9.5 90-11.1/17.9-CS9.5 90-11.1/19.9-CS9.5 90-11.1/21.9-CS9.5 90-11.1/23.9-CS9.5	27-11.1-CS9.5	37-031 -032 -033 -034 -035 -036	HSS	.945	.394



-037



Integrus

METALS

4375 - 14 STREET N.E.
CALGARY, AB T2E 7A9
(403) 250-2866 FAX (403) 250-9894

FAX SHEET

TO:

Stephen

FROM:

Christine

COMPANY:

Aero design

DATE:

04/24/02

FAX #:

250-8333

TOTAL # OF PAGES:

3

RE:

MTR

CC:

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES / COMMENTS:

here is the info you
requested.

thank-you,

Christine

CERTIFIED INSPECTION REPORT

Alcoa Inc.


PITTSBURGH, PA DAVENPORT WORKS

Ship From: DAVENPORT, IA.

We hereby certify that the material covered by this certificate has been inspected and, and has been found to meet, the applicable requirements described therein, including any specifications forming a part of the description and that sample representative of the material met the composition limits and had the mechanical properties shown on the face of this sheet, Part.



Vernon J. Tarr
Executive Vice President Alcoa NIS Products



Michael J. Hughes
Quality Assurance Manager

148912 258006

Ship Date B.I. No.
2001-09-16 01041

Invoice No. Alcoa No. Item
82282 IC068236-1

Page 1

P.O. No./Govt Contract No. Customer

405167 20010913 ATLAS IDEAL METAL

Ship To: ATLAS IDEAL METALS
258 ORENDA ROAD,
BRAMPTON, ON, L6T 4A9

Item Description
3.000 IN TH X 48.5 IN W X 144.5 IN LN (W) A/T 6061-
T651 RECTANGULAR PLATE MILL FINISH, SAWED
P/N 55459341. PER AMS-QQ-A-250/11 PER
AMS4027 REV L PER ASTM B209 REV 01 ((MARKED))
INTERLEAVED MAX GROSS SKID WGT: 5000 LB QUAN TOL +/-
10 % CQR 0128300 REV 01 CUST REQ 01-09-
14 *** W/E 01-09-22 ***

Num	Package Ticket	Lot	Weight	Quantity	UOM	Pc Id/Serl
1	589407	647621	4137	2	PC	

Notes for CQR: 0128300.1

PRODUCT PRODUCED AND MARKED TO THE REQUIREMENTS OF AMS-QQ-A-250/11 ALSO MEETS THE REQUIREMENTS OF QQ-A-250/11F. PRODUCT
PRODUCED AND MARKED TO THE REQUIREMENTS OF QQ-A-250/11F ALSO MEETS THE REQUIREMENTS OF AMS-QQ-A-250/11.

CQR: 0128300.1 -Specification Limits -----

Temp Dir	UTS KSI	TYS KSI	EL4D PCT
T651 Long Transv.	Max		
	Min	42.0	35.0

Chemical Composition	SI	FE	CU	MN	MG	CR	ZN	TI	Each	Total	Aluminum
Alloy 6061	Max	.8	.7	.40	.15	1.2	.35	.25	.15	.05	.15
	Min	.40	.15		.8	.04					REMAIN

Lot: 647621 -Mechanical, Physical, Metallography, Quantometer Results -----

Temp Dir	No. Test	UTS KSI	TYS KSI	EL4D PCT
T651 Long Transv.	4	Max	48.6	44.7
		Min	47.9	44

CERTIFIED INSPECTION REPORT

Alcoa Inc.

PITTSBURGH, PA DAVENPORT WORKS

Ship From: DAVENPORT, IA.

We hereby certify that the material covered by this certificate has been inspected with, and has been found to meet, the applicable requirements described herein, including any specifications forming a part of the description and that samples representative of the material meet the composition limits and meet the mechanical properties shown on the face of this sheet.

Part:



Vernon J. Tamm
Executive Vice President Alcoa Mill Products



Michael J. Skoglund
Quality Assurance Manager

148912

258006

Ship DateB.L. No.Invoice No.Alcoa No. Item

Page 2

2001-09-18

01041

82282

IC068236-1

P.O. No./Govt Contract No.Customer

405167 20010913

ATLAS IDEAL METAL

Lot: 647621 - Mechanical, Physical, Metallography, Quantometer Results (cont.) -----
 Cast Number Chemical SI FE CU MN MG CR ZN TI
 5248R022 Actuals .64 .5 .26 .01 0.9 .20 .00 .02

Wd
5/16
p-50
npco

~~CGMHF~~
CGMHF

$$26 \frac{11}{16} - \frac{1}{32}$$

$$26 \frac{21}{32}$$

IN ARDRIE
EAGLE'S SCRAPYARD

$$24 - \frac{1}{32}$$

$$2 \frac{7}{16}$$

$$26 \frac{7}{16} - \frac{1}{32}$$

$$\frac{1}{16} - \frac{1}{32}$$

$$26 \frac{11}{16} - \frac{1}{32}$$

FWD
FTG

$$26 \frac{21}{32}$$

$$= 26.66$$

MEASURED FWD. FTGS. 26.66" APART
ON CGMHF, 206L SN 45093
~ BUT ~

MAINT. MANUAL OF 206L-4 GIVES
BUT LINE OF 13.23 IN

RF1

$$20 \frac{9}{16} + \frac{1}{32}$$

$$= 20 \frac{19}{32}$$

$$= 20.59$$

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Last Database Update: Tue Apr 9 12:54:04 2002

To print registration information, check the checkbox for each registration to be printed and click on "Retrieve Selected Entries" at the bottom of the list.

☐ Check for printing

N-number	:	N752HL	N753HL
Aircraft Serial Number	:	51014	51297
Aircraft Manufacturer	:	BELL	
Model	:	206L-3	
Engine Manufacturer	:	ALLISON	
Model	:	250-C30 SER	
Aircraft Year	:	1982	
Owner Name	:	WELLS FARGO BANK NORTHWEST NA TRU	
Owner Address	:	79 S MAIN ST 3RD FL MAC U1254-031 SALT LAKE CITY, UT, 84111	
Registration Date	:	24-Jul-2001	
Airworthiness Certificate Type	:	Standard	
Approved Operations	:	Normal	

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- ON EAGLE'S PAD IN MARCH + APRIL 2002
 - USED FOR DIM'S OF FWD + AFT FTG'S

Transport
CanadaTransports
Canada[Feedback](#)[New Search](#)[How do I?](#)[Search](#)[Contents](#)[Civil Aviation](#)[TC](#)**Database Last Updated: 2002-04-22****This Entry Last Updated: 1991-05-31**

<i>Mark</i>	C-GMHF	<i>Serial No</i>	45093
<i>Make</i>	BELL	<i>Model</i>	206L
<i>Base Of Operation</i>	QUE., LA SARRE	<i>File Location</i>	Quebec
<i>Reg Purpose</i>	Commercial	<i>Flight Authority</i>	Certificate of Airworthiness
<i>Category</i>	Helicopter	<i>Weight (Kgs)</i>	1814
<i>Year of Manufacture</i>	1977	<i>Year Imported</i>	1979
<i>Country of Manufacture</i>	United States		

Owner Registration:*Issue date* 1990-12-27**Removal from the Register:***Reason for Removal* Destroyed*Year of Removal* 1991**Engine:**

<i>Category</i>	Turbo Shaft	<i>Number of Engines</i>	1
-----------------	-------------	--------------------------	---

Owner Information:

<i>Name</i>	LES HELICOPTERES ABITIBI LTEE		
<i>Address</i>	341 ROUTE 111 OUEST, C.P. 188		
<i>City</i>	LA SARRE	<i>Province</i>	Quebec
<i>Postal Code</i>	J9Z 2X5	<i>Region</i>	Quebec

Search the Current Database for C-GMHF

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Transport
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<i>Mark</i>	C-GMHF	<i>Serial No</i>	45075
<i>Make</i>	BELL	<i>Model</i>	206L
<i>Base Of Operation</i>	QUE., LA SARRE	<i>File Location</i>	Quebec
<i>Reg Purpose</i>	Commercial	<i>Flight Authority</i>	Certificate of Airworthiness
<i>Category</i>	Helicopter	<i>Weight (Kgs)</i>	1814
<i>Year of Manufacture</i>	1977	<i>Year Imported</i>	1991
<i>Country of Manufacture</i>	United States		

Owner Registration:

<i>Issue date</i>	1991-08-12	<i>Owner Registration</i>	1991-07-19
-------------------	------------	---------------------------	------------

<i>Engine:</i>	Turbo Shaft	<i>Number of Engines</i>	1
----------------	-------------	--------------------------	---

Owner Information:

<i>Name</i>	LES HELICOPTERES ABITIBI LTEE	<i>Multiple Owners</i>	No
<i>Address</i>	341 ROUTE 111 OUEST, C.P. 188		
<i>City</i>	LA SARRE	<i>Province</i>	Quebec
<i>Postal Code</i>	J9Z 2X5	<i>Region</i>	Quebec

Search the History Database for C-GMHF

[Aircraft Registration](#) [Civil Aviation](#) [Transport Canada](#)

Canada

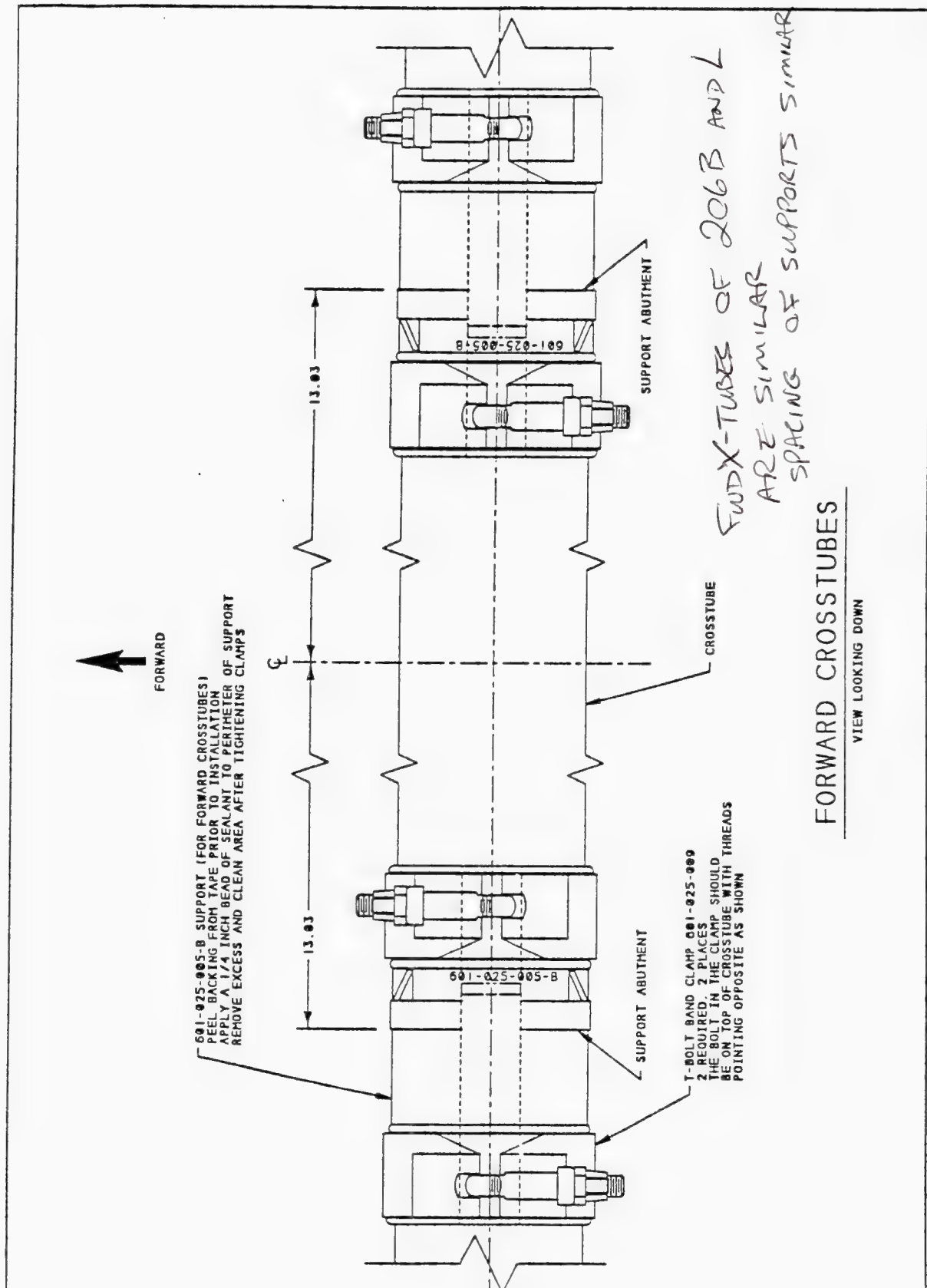
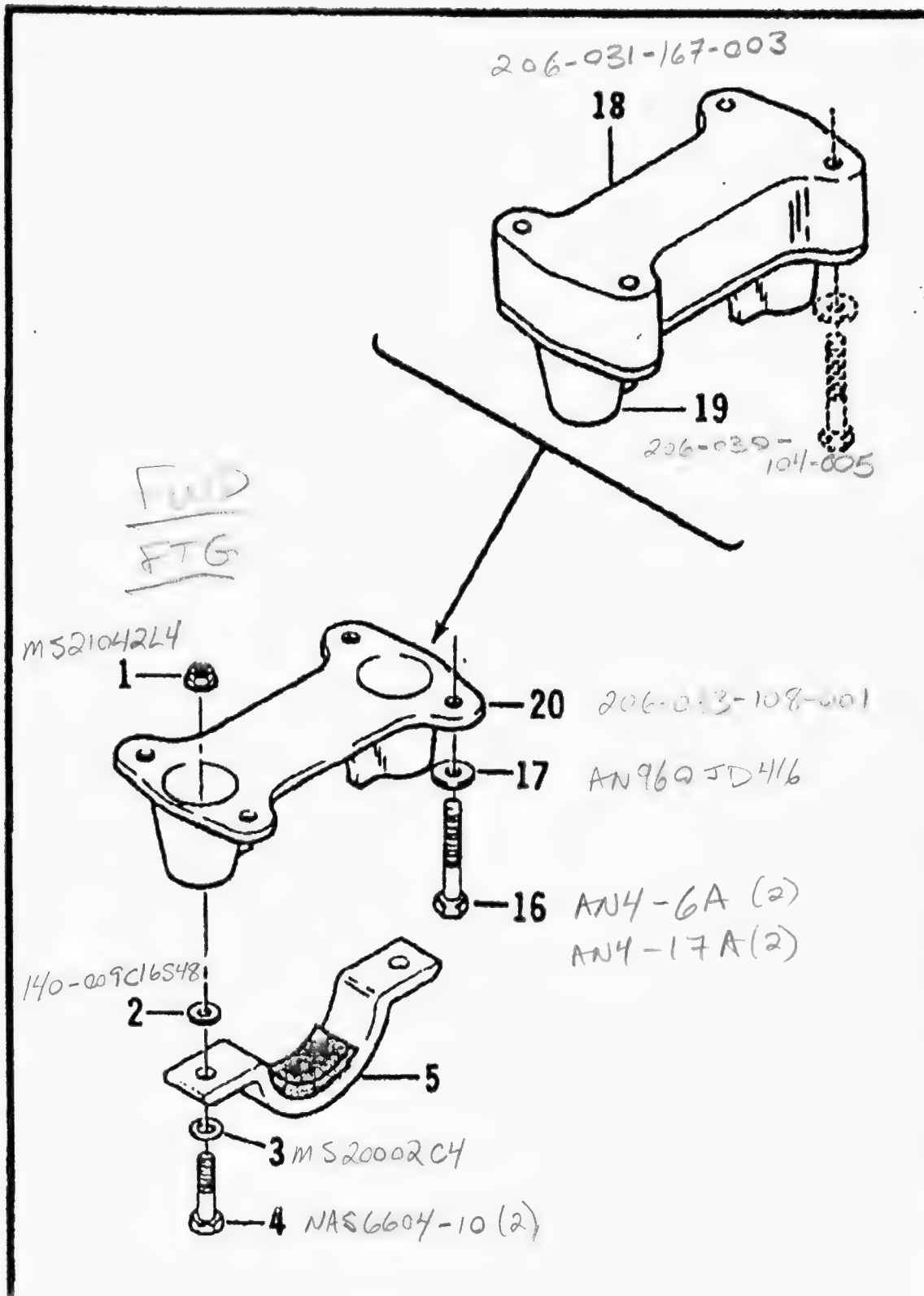


FIGURE 1
CLAMP ORIENTATION



BHT-206L-SERIES-IPB



A

AFT
FTG

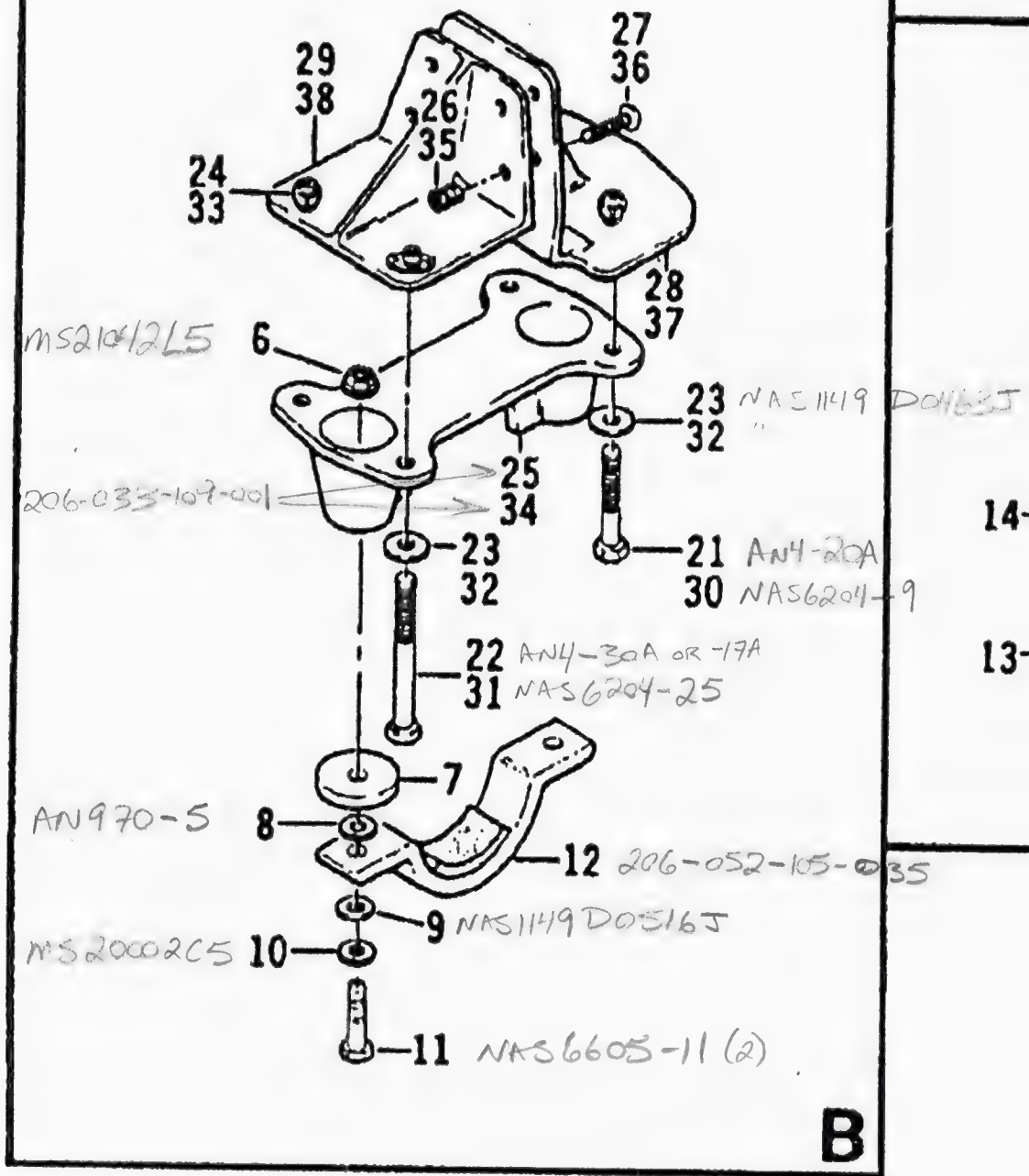
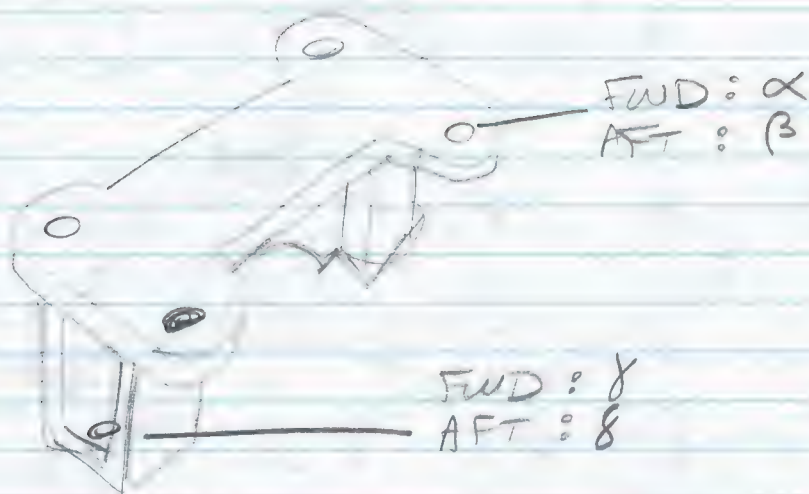


Figure 32-7. Support installation, landing



206 L/L1 45004-45556, 46601-SUB | L3/L4/L1 (45557-SUB)

~~AN4-17A~~

γ NAS6604-10
 δ NAS6605-16

NAS6604-10
NAS6605-11

☒ FWD FITTING, ITEM #16 IN I.P.B.

(16) AN4-6A (4) ON L1 (45557-SUB), L3, L4

(16) AN4-17A (4) ON L/L1 (45004-45556, 46601-SUB)

☒ AFT FITTING, ITEMS #21, 22, 30, 31 IN I.P.B.

(21) AN4-20A (2) ON L/L1 (45004-45556, 46601-SUB)

(21) AN4-7A (2) ON L1 (45557-SUB)

(22) AN4-30A (2) ON L/L1 (45004-45556, 46601-SUB)

(22) AN4-17A (2) ON L1 (45557-SUB)

(30) NAS6204-9 (4) ON L3/L4

(31) NAS6204-25 (4) ON L3/L4

BARREL NUT STRENGTH

301 SS.
ANNEALED

$$F_{TU} = 73 \text{ KSI}$$
$$F_{su} = 59 \text{ KSI}$$

$$D_{\text{BOLT}} = 0.375 \text{ @ } 2\frac{1}{4} \text{ TPI} \Rightarrow 0.0417 \text{ IN PER THREAD} = 9 \text{ THREADS ENGAGED}$$

$$\text{PITCH DIA} = 0.3479 - 0.3450$$

$$\frac{\text{P.D.} \times D}{2} = 0.0652 \text{ in}^2$$

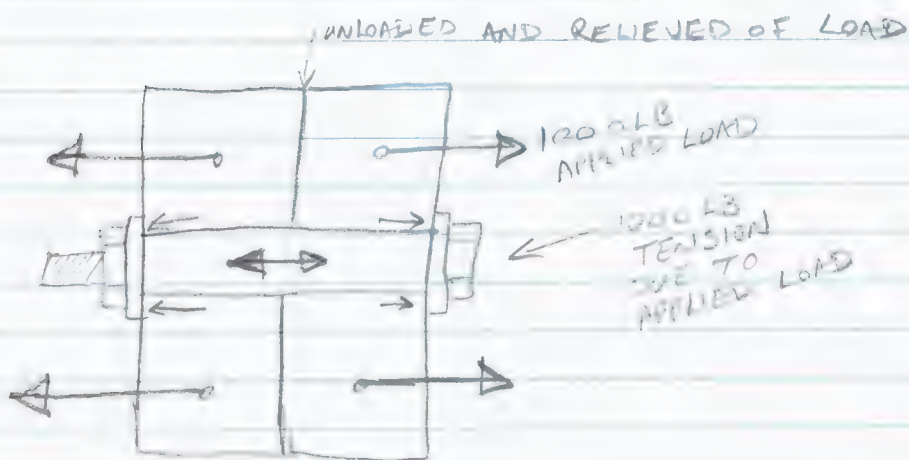
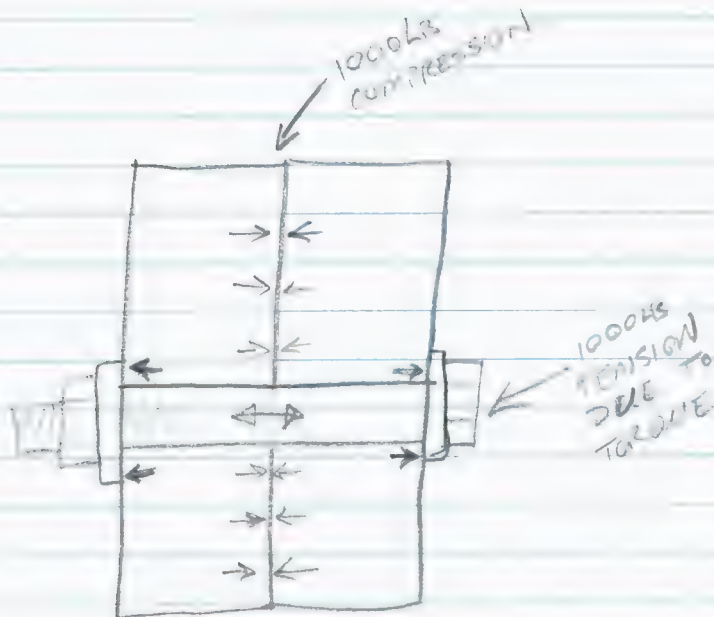
$$A = (\pi \text{ P.D.}) \left(\frac{D}{2} \right) = 0.203 \text{ in}^2 \quad \text{--- HELICAL AREA OF PITCH DIAMETER OVER 9 THREADS,}$$

AS P.D. \rightarrow 0.205

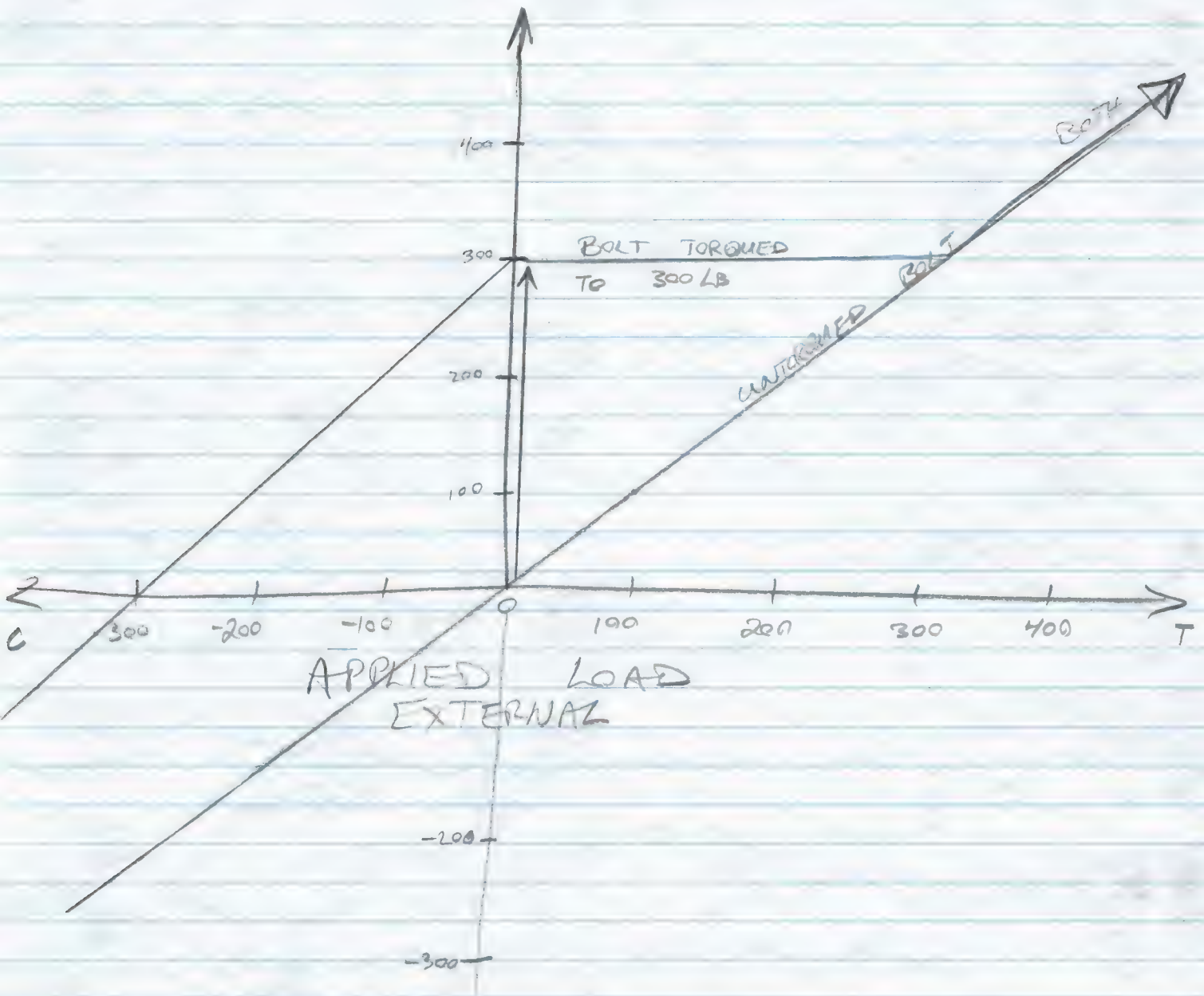
$$P_{ULT} = F_{su} \cdot A = 10,161 \text{ LB}$$

SEE BRUNN pg C13.18

EXPLANATIONS IS ACTUALLY QUITE CLEAR

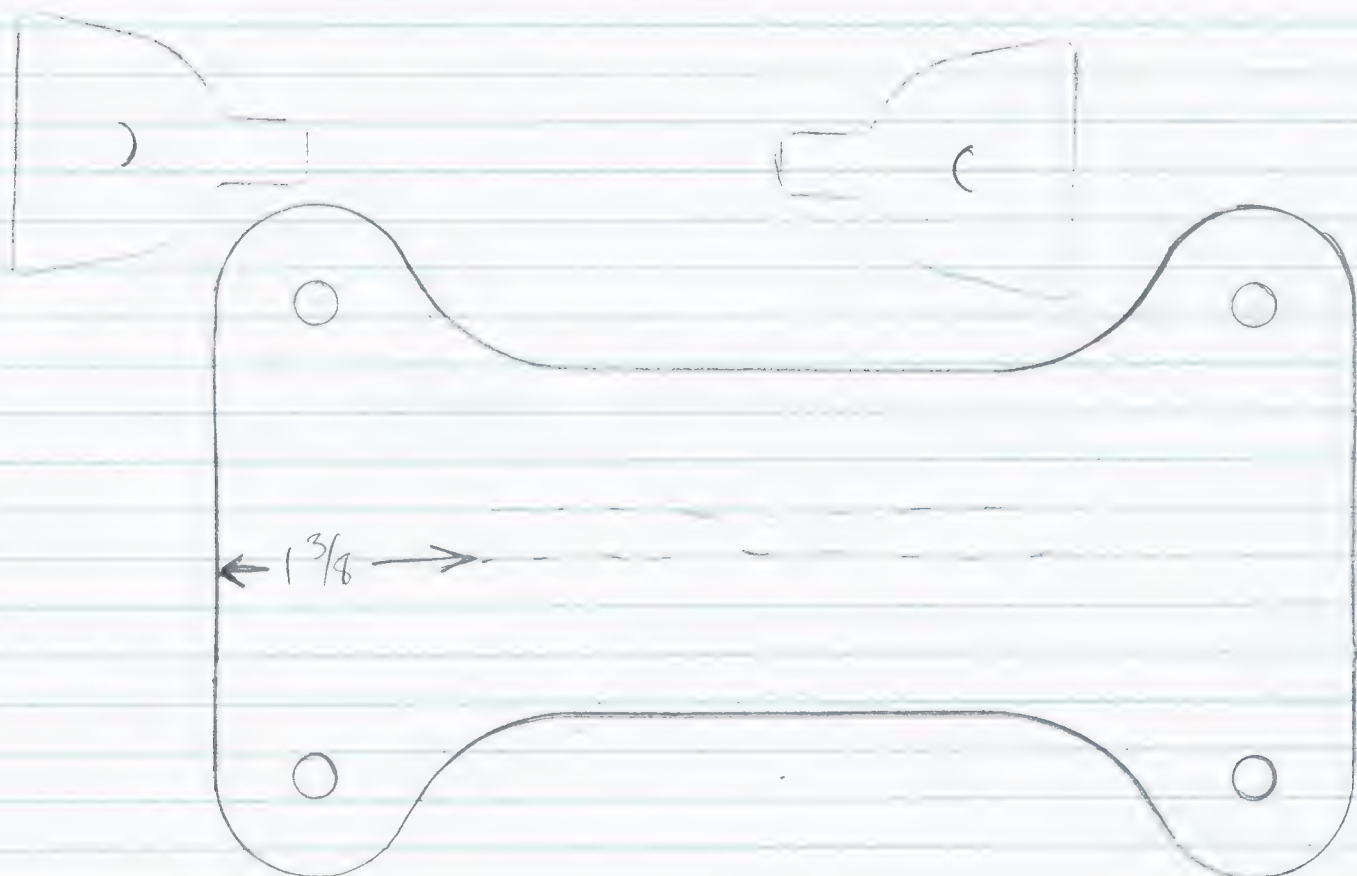
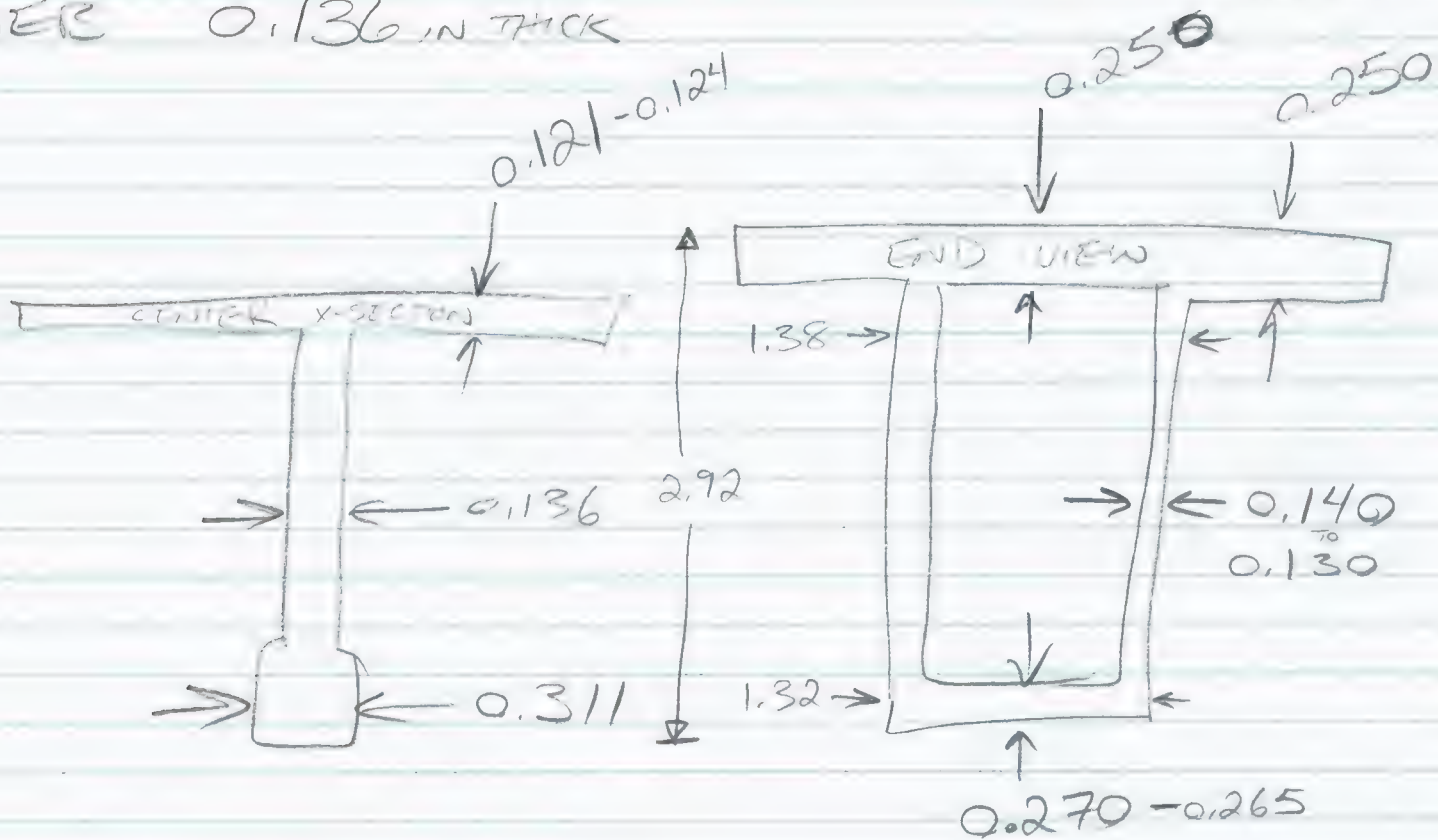


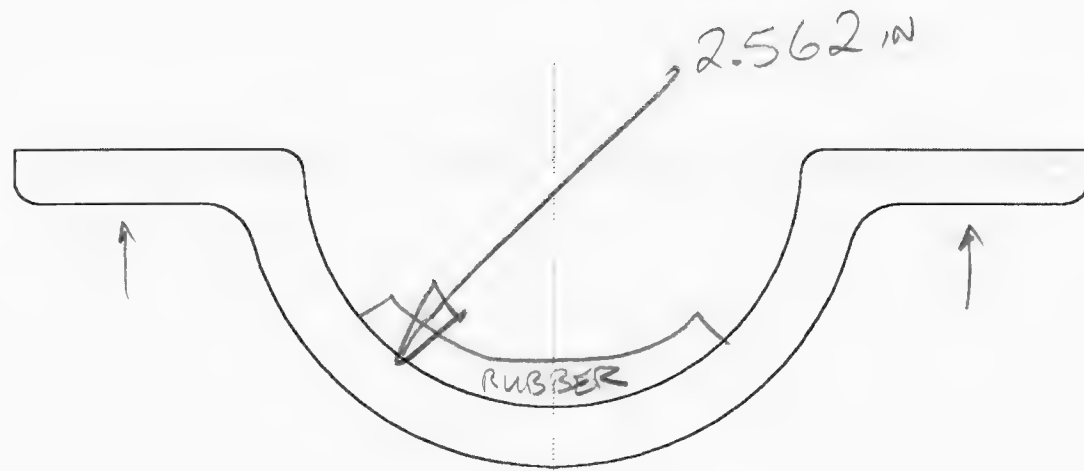
INTERNAL
LOAD



FWD FTG 206-033-108-001

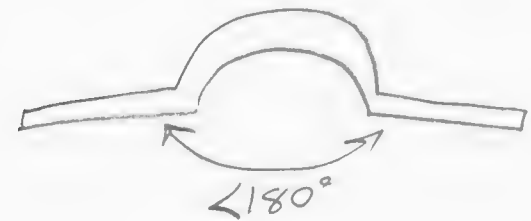
WER 0.136 IN THICK





TRACE MATCHES ~~SHACKLE~~ ~~FITTING~~

EXCEPT:
SHACKLE IS CURVED SHAPED



SHACKLE UNDER FITTING
BOLTS $4\frac{1}{2}$ " APART

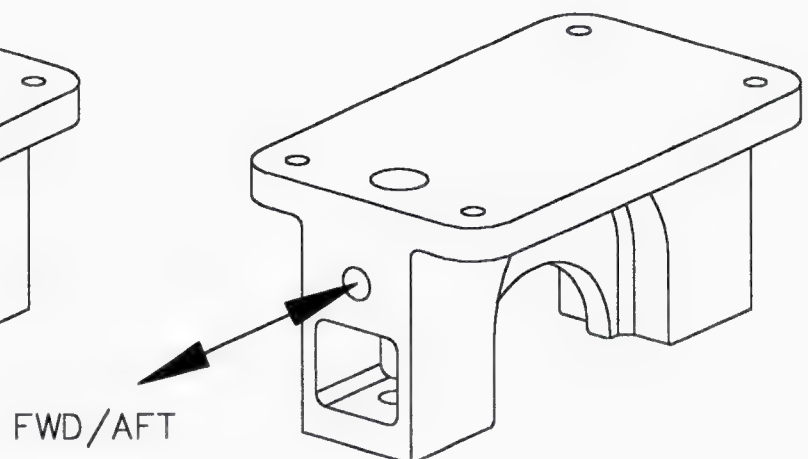
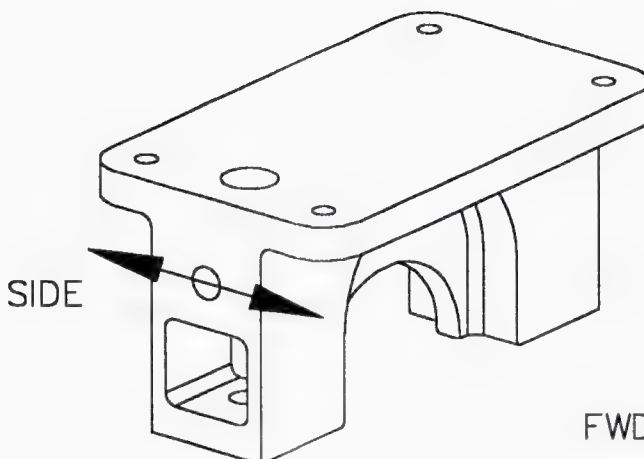
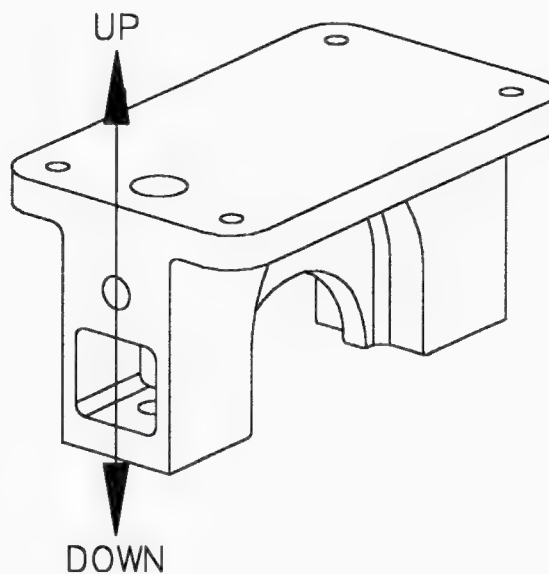
DESIGN ALLOWABLE LOADS

EXTERNAL ATTACHMENT PROVISIONS

THE FOLLOWING CONDITIONS
MUST BE MET TO ACHIEVE
THE LOADS SHOWN HERE:

- AN6 BOLT INSTALLED
- FULL THREAD ENGAGEMENT
- BOLT TORQUED TO
90 TO 110 INCH-POUNDS

DIRECTION	FLIGHT (POUNDS)	ULTIMATE (POUNDS)
UP/DOWN	4375	6563
FWD/AFT	3333	5000
SIDE	1667	2500



From :

PHONE No. : 00

Apr. 05 2002 10:53AM P01

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

FAX COVER SHEET

DATE: April 5, 2002 TIME: 10:32 AM
TO: M&M Aerospace H/W PHONE: 310-900-1300
Pamela Horton FAX: 310-900-1319
FROM: S. Fahey PHONE: 403-250-8027
Aero Design Ltd. FAX: 403-250-8333

Pamela Horton
M & M AEROSPACE
DATE: 4/8/02
Fax: 310-900-1319
Ph: 310-900-1315

Number of pages including cover sheet: 1

RE: PRICE QUOTE

I would like a quote on the following items, noting which are in stock and which are not:

AN Bolts:	NAS Bolts:	MS Nuts:
AN4-6A 50	NAS6204-9 25	MS21042L4 50
AN4-7A 50	NAS6204-25 25	MS21042L5 50
AN4-17A 50	NAS6604-10 25	
AN4-20A 50	NAS6605-11 25	
AN4-30A 50		
AN6-20A 50		
AN6-21A 50		

AN Washers:	NAS Washers:	Barrel Nuts (w. retainer):
AN960JD10L 100	NAS1149D0463J 100	SPS 2752-064 25
AN960JD416L 100	NAS1149D0516J 100	SPS 2752-054 25
AN960JD516L 100		SPS 2752-048 25

Regards,
Stevan Fahey

QUOTE#: 499419**M & M Aerospace Hardware, Inc.**

PRT DATE: 04/08/02
TO: 000272
AERO DESIGN LTD
1055 MC TAVISH RD NE
CALGARY, AB
CANADA T2E 7G9

*** QUOTATION ***

PAGE: 1

FROM:
M & M Aerospace Hardware, Inc.
2374 Pacifica Place
Rancho Dominguez, CA 90220-6214
Tel: 310-900-1300
Fax: 310-900-1319

APR 8 2002

QUOTE DATE: 04/08/02
EXPIRES : 05/08/02
QUOTED BY : Pamela Horton

QUOTE# : FAX
CONTACT: STEVEN
PHONE# :
FAX# :

ITM	QTY	PART NUMBER	PRICE	UM	DELIVERY INFO
001	50	AN4-6A	0.40000	EA	
	100		0.20000	EA	
	COMMENT: STK				
002	50	AN4-7A	0.40000	EA	
	100		0.20000	EA	
	COMMENT: STK				
003	50	AN4-17A	0.40000	EA	
	100		0.20000	EA	
	COMMENT: STK				
004	50	AN4-20A	0.40000	EA	
	100		0.20000	EA	
	COMMENT: STK				
005	50	AN4-30A	0.60000	EA	
	COMMENT: STK				
006	50	AN6-20A	0.40000	EA	
	COMMENT: STK				
007	50	AN6-21A	0.70000	EA	
	COMMENT: STK				
008	25	NAS6204-9	0.80000	EA	
	COMMENT: STK				

CONTINUED

QUOTE#: 499419**M & M Aerospace Hardware, Inc.**

PRT DATE: 04/08/02
 TO: 000272
 AERO DESIGN LTD
 1055 MC TAVISH RD NE
 CALGARY, AB
 CANADA T2E 7G9

*** QUOTATION ***

PAGE: 2

FROM:
 M & M Aerospace Hardware, Inc.
 2374 Pacifica Place
 Rancho Dominguez, CA 90220-6214
 Tel: 310-900-1300
 Fax: 310-900-1319

QUOTE DATE: 04/08/02
 EXPIRES : 05/08/02
 QUOTED BY : Pamela Horton

QUOTE# : FAX
 CONTACT: STEVEN
 PHONE# :
 FAX# :

ITM	QTY	PART NUMBER	PRICE	UM	DELIVERY INFO
009	25	NAS6204-25	0.80000	EA	
	COMMENT: STK				
010	25	NAS6604-10	0.80000	EA	
	COMMENT: STK				
011	25	NAS6605-11	0.80000	EA	
	COMMENT: STK				
012	50	MS21042L4	0.40000	EA	
	100		0.20000	EA	
	COMMENT: STK				
013	50	MS21042L5	0.40000	EA	
	COMMENT: STK				
014	100	AN960JD10L	0.20000	EA	
	200		0.10000	EA	
	COMMENT: STK QTG: NAS1149D0332J				
015	100	NAS1149D0416J	0.20000	EA	
	200		0.10000	EA	
	COMMENT: QTG: NAS1149D0416J IN LIEU OF AN960JD416L				
016	100	AN960JD516L	0.20000	EA	
	200		0.10000	EA	
	COMMENT: STK QTG: NAS1149D0516J				

CONTINUED

QUOTE#: 499419**M & M Aerospace Hardware, Inc.**

PRT DATE: 04/08/02
TO: 000272
AERO DESIGN LTD
1055 MC TAVISH RD NE
CALGARY, AB
CANADA T2E 7G9

*** QUOTATION ***

PAGE: 3

FROM:
M & M Aerospace Hardware, Inc.
2374 Pacifica Place
Rancho Dominguez, CA 90220-6214
Tel: 310-900-1300
Fax: 310-900-1319

QUOTE DATE: 04/08/02
EXPIRES : 05/08/02
QUOTED BY : Pamela Horton

QUOTE# : FAX
CONTACT: STEVEN
PHONE# :
FAX# :

ITM	QTY	PART NUMBER	PRICE	UM	DELIVERY INFO
017	100	NAS1149D0463J	0.20000	EA	
	200		0.10000	EA	
	COMMENT: STK				
018	100	NAS1149D0516J	0.20000	EA	
	200		0.10000	EA	
	COMMENT: STK				
019	25	2752-064	40.00000	EA	
	COMMENT: STK				
020	25	2752-054	53.00000	EA	
	COMMENT: STK				
021	25	2752-048	30.00000	EA	
	COMMENT: STK				

ALL ORDERS SUBJECT TO 100% RESTOCKING CHARGE

QUOTES VALID FOR 30 DAYS

ALL STOCK SUBJECT TO PRIOR SALE

M & M AEROSPACE IS AN AUTHORIZED HI-SHEAR DISTRIBUTOR.

M&M IS ISO 9002 REGISTERED.

TENSION = 2160 LB
SHEAR = 1630 LB

REPORT 261.02

HONEYCOMB INSERT
LOAD TEST

ENGINEERING REPORT

REFERENCE

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta

JULY 25, 1997

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1.0 INTRODUCTION

There are many applications that require fastening brackets or attachment fittings to Honeycomb Laminate structures. A common application is fastening mounting brackets to the bottom of helicopter cabins which consist of a Honeycomb panel.

Threaded "inserts" are used to provide hardpoint attachments to Honeycomb panels. These inserts are bonded directly into the Honeycomb structure for strength. A large diameter head prevents the insert from pulling directly through the Honeycomb.

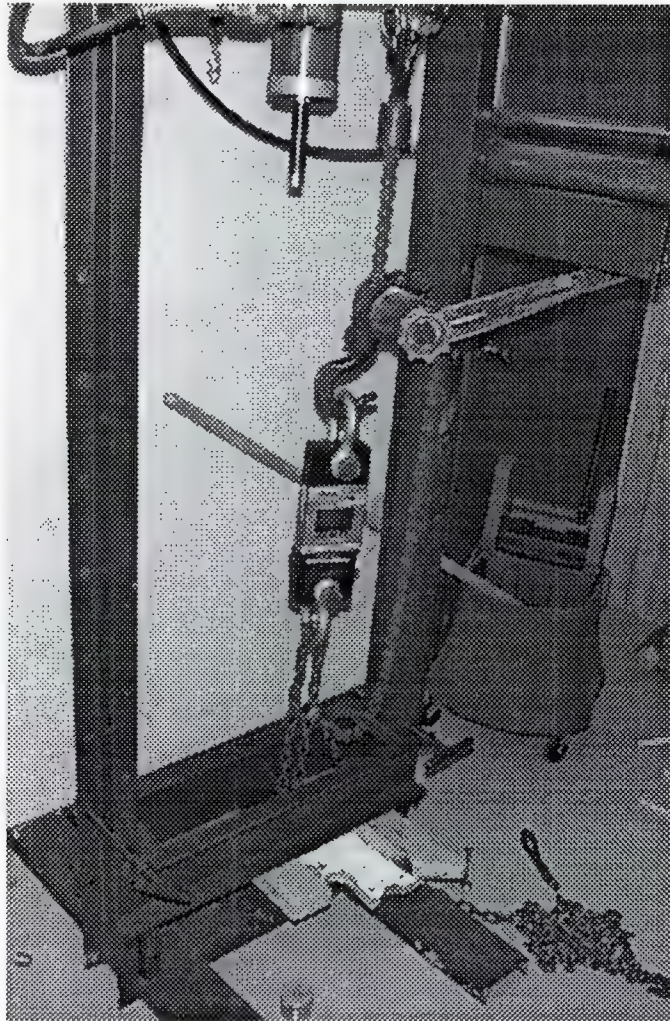
Load tests were performed on two inserts that were bonded into 1" thick Honeycomb which came directly from the bottom panel of a Bell 206 helicopter. A pure tensile load and a pure shear load were applied to the inserts in separate tests to determine the ultimate load at which they would fail.

2.0 PROCEDURE

Two inserts, Bell part no. 80-007-16-4, were bonded into a 1" thick section of honeycomb laminate, 0.012" thick 2024T3 outer and inner skin, salvaged from the belly tub of a Bell 206 helicopter forward of the front landing gear cross tube. The salvaged section was approximately 10" by 10".

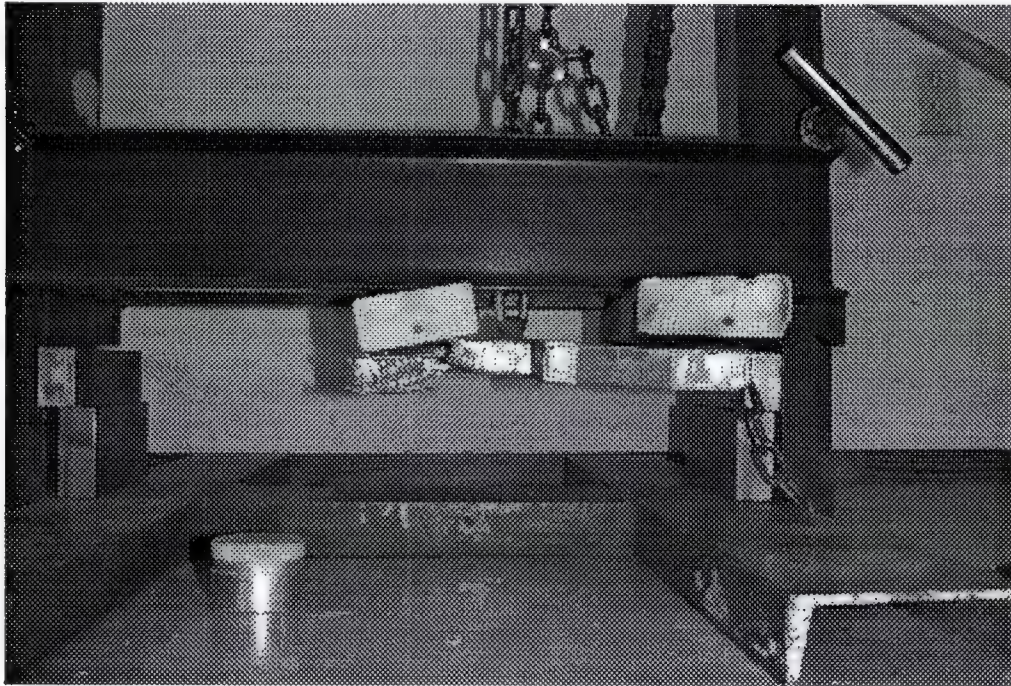
- | | |
|------------|---|
| Test no. 1 | The honeycomb panel was simply supported at two of its edges with the insert mid-way between the two supports. A pure tension load was applied to the insert. |
| Test no. 2 | The honeycomb panel was supported along one of its edges. A pure shear load was applied to the insert. |

3.0 Tensile Test



TENSILE TEST SETUP

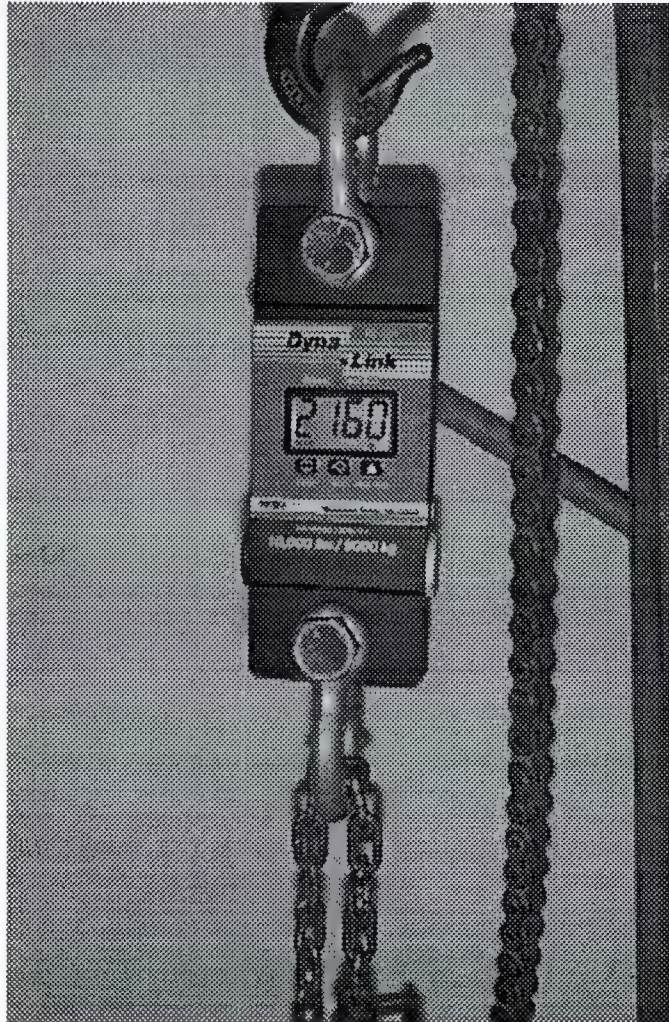
Figure 1



Honeycomb Simply Supported at Ends with Insert in the Middle.

Figure 2

In the above picture, the Honeycomb panel was supported at the ends to represent a simply supported beam in bending. An eye loop was then fastened to the insert by an AN4 bolt. A pure tensile load was then applied to the insert and pulled until evidence of failure occurred.



MAXIMUM TENSILE LOAD

Figure 3

A loads of 2,160 lbs was applied without any noticeable evidence of the insert or its bonding to the honeycomb panel failing or suffering permanent deformation. The test was terminated, due to the failure of the honeycomb mounting in the test stand.

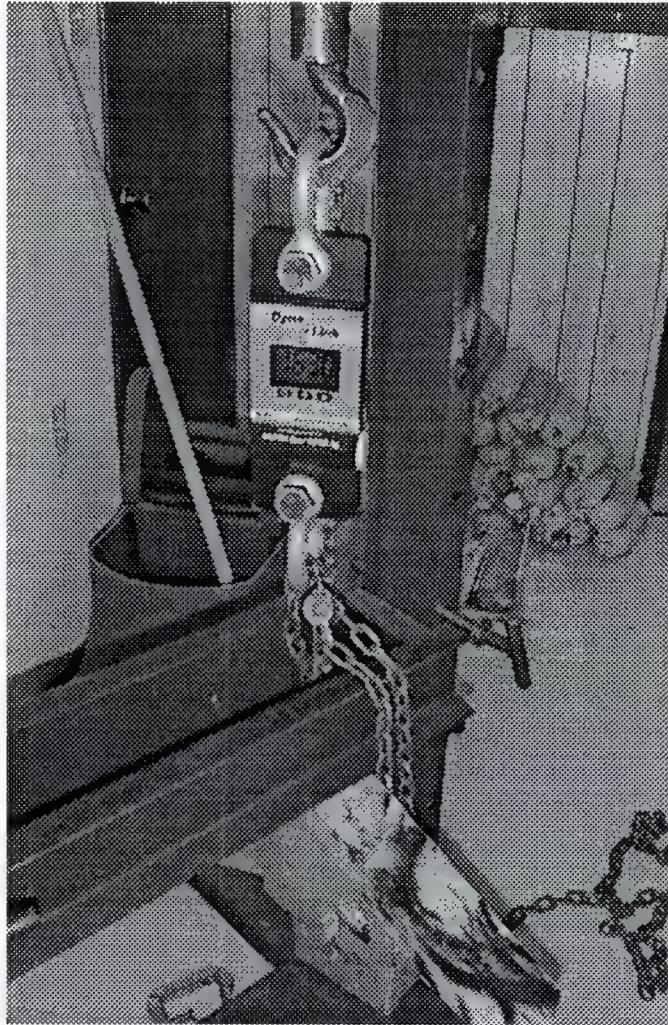


Damage to the Honeycomb Resulting from Tensile Test.

Figure 4

5.0 Shear Test

Using the same test stand setup, the Honeycomb panel was oriented in a way to represent a pure shear load applied to the insert. A shear load of over 1630 lbs was applied to the insert. Again the test had to stop due to failure of the honeycomb mounting.



SHEAR TEST SETUP

Figure 5

Alix Machining Inc.
#111 4712 13th Street N.E.
Calgary, Alberta
T2E 6P1
403-291-5313
fax: 291-7056

QUOTATION

Date: 1 APRIL/02

For: AERO DESIGN LTD Attention: TED / STEVE

Fax #: 250-8333 Phone #: 250-8023

Job Description: MACHINE BELL 206L SERIES EXTERNAL
ATTACHMENT PROVISIONS FORWARD/AFT
FITTING

Material to be used: 6061 T6

Material supplied by: Your Company Alix Machining Inc. ✓

Total Cost: — Estimated delivery time: 3-4 wks after order.

Comments: Hi TED & STEVE,
FORWARD FITTING PER PIECE \$657.20
AFT FITTING " " \$780.00

THANKS

STEVE

Please don't hesitate to call with any Questions/ Comments.

All quotes valid for 30 days.
Prices do not include G.S.T.

AERO DESIGN LTD.

1045 McTavish Rd. N.E.
Calgary, Alberta
T2E 7G9

08 April, 2002

Transport Canada
Aircraft Certification Division,
800 – 1601 Airport Road
Calgary, AB,
T2E 7Z8

Attn: Mr. Greg Oucharek

Our File: 493
Your File: u/a

Re: Bell 206L Basket Attachment Provision

Greg:

In response to your fax of April 4, 2002, I have updated the compliance program CP493, Rev. 1 (enclosed).

I have added FAR 27.305 to the compliance program. Its exclusion was an oversight.

I have added FAR 27.865 to the compliance program. The intent of 865 is only the helicopter-hook-line-payload system of transporting goods or personnel. The provision can have multiple purposes, each having a different system of equipment attached. FAR 27.865 cannot apply to the provision itself. FAR 27.865 will apply to the approved installation that attaches to it, to suit the given purpose.

Comments associated with 27.307 have been added to the compliance program to clarify the approach. Similarity is used to establish the interchangeability of the fittings, whereas the path of loads due to the mounted equipment is analyzed separately. A draft copy of the allowable loads diagram is enclosed.

I have also added FAR 27.571, as you requested. Looking at the load path of the provisions, the stresses are relatively low (5 ksi) and the cycles do not accumulate rapidly (1 "empty-full-empty" cycle per flight). Fatigue can be dealt with using data from Mil-Hdbk-5H.

I await your response.

Regards,



S. Fahey, Technologist

Encl.

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

APPLICANT: AERO Design Ltd.
1045 McTavish Rd. N.E.
Calgary, Alberta, T2E 7G9

DATE: 12 March, 2002
REV. No. 1 4 April, 2002

CORRESPONDANCE TO:
(If other than applicant)

MAKE: Bell Helicopter
MODEL: 206B, 206L, 206L-1, 206L-3, 206L-4

REGISTRATION: All Applicable
SERIAL No.: All Applicable

NATURE OF WORK: Installation of External Attachment Provisions

MODEL CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.
MODIFICATION CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
Paragraph	Amdt.				
Subpart B – Flight					
27.29	24 Empty Weight and Corresponding C of G	Data specified on inst'n drawing		X	
Subpart C – Strength Requirements					
27.301	24 Loads	Compliance with 23.471, 23.473, 23.337 and 23.561		X	
27.303	24 Factor of Safety	Analysis		X	
27.305	24 Strength and Deformation	Analysis		X	
27.307	28 Proof of Structure	Analysis		X	a) Original load path unaffected, as shown by comparison of material strengths. b) Provision load path analyzed to establish design allowable loads.
27.337	28 Limit Maneuvering Load Factor	Analysis		X	Limit maneuvering load factor to be applied in analysis to demonstrate vertical capacity of external attachment

Airworthiness Requirement	Subject for Compliance or Documentary Proof		Form of Substantiation	DOT	DAR	Comments
27.471	24	Ground Loads – General	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.473	24	Ground loading conditions and assumptions	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
Paragraph	Amdt.					
27.501	28	Ground Loading Conditions – Landing Gear with Skids	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.561	24	Emergency Landing Conditions	Analysis		X	Ultimate manouvering load factor exceeds downward emergency landing load factor.
27.571	28	Fatigue Evaluation of Flight Structure	Analysis	X		Provision fastener joint only.
Subpart D – Design and Construction						
27.601	24	Design	Drawings		X	Design is conventional.
27.603	24	Materials	Drawings		X	Materials used are specified in Mil-Hdbk-5H.
27.605	24	Fabrication Methods	Drawings		X	Design is conventional.
27.609	24	Protection of Structure	Drawings		X	
27.611	24	Inspection Provisions	Drawings		X	Design is easy to inspect.
27.613	28	Material Strength Properties and Design Values	Values used as per Mil-Hdbk-5H		X	
27.625	24	Fitting Factor	Analysis		X	
27.725	24	Limit Drop Test	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.727	28	Reserve Energy Absorbtion Drop Test	Analysis to demonstrate equivalent strength to existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.865	28	External Load Attaching Means	N/A	X		Provision only: Consideration required for approval of equipment attached to provision.

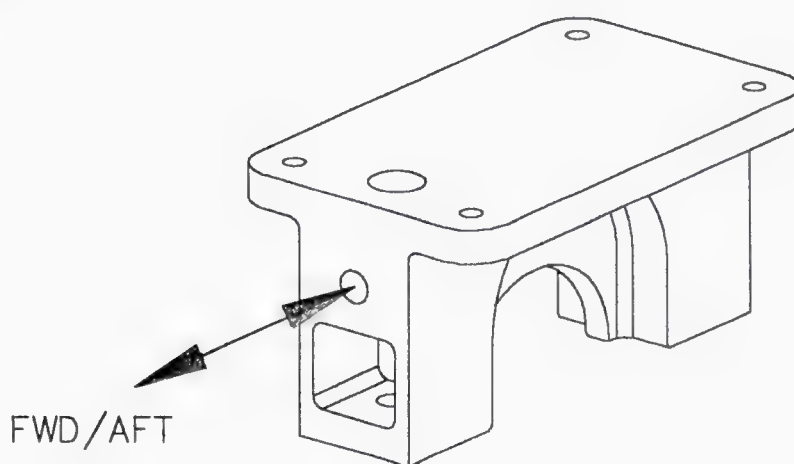
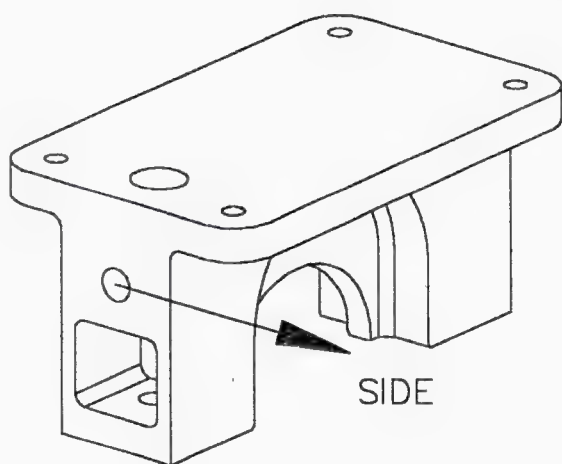
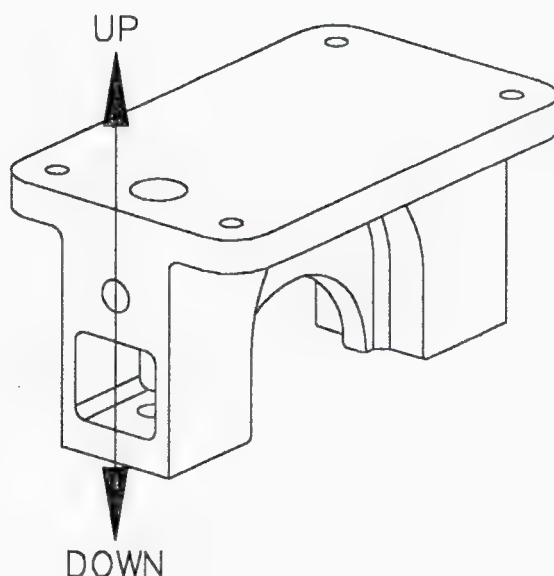
DESIGN ALLOWABLE LOADS

EXTERNAL ATTACHMENT PROVISIONS

THE FOLLOWING CONDITIONS
MUST BE MET TO ACHIEVE
THE LOADS SHOWN HERE:

- AN6 BOLT INSTALLED
- FULL THREAD ENGAGEMENT
- BOLT TORQUED TO
90 TO 110 INCH-POUNDS

DIRECTION	LIMIT (POUNDS)	ULTIMATE (POUNDS)
UP/DOWN	000	000
FWD/AFT	000	000
SIDE	000	000



Department of Transport

Supplemental Type Certificate

This approval issued to:

Aero Design Ltd.
1045 McTavish Rd. NE
Calgary, Alberta
T2E 7G9

Approval Number: SH02-

Issue No.: 1

Date of Approval:

Date of Issue:

Aircraft / Engine Type: Bell Helicopter

Model: 206L, 206L-1, 206L-3, 206L-4

Registration: All Eligible

Serial No.: All Eligible

Canadian Type Certificate or Equivalent: H-92

Description of Design Change: External Attachment Provisions

Required Equipment and Limitations: Installation of External Attachment Provisions to be completed in accordance with Transport Canada approved, AERO Design Ltd. Document Control List, DCL493, Rev. 0, or later approved revision.

Basis of Certification for installation is FAR 27, at amendment 27-24.

Separate approval is required for any equipment to be attached to the provisions.

Conditions: This approval is only applicable to the type/model of aeronautical product specified therein. Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated will not adversely affect the airworthiness of the modified product.

For the Minister of Transport

Canada



Transport
Canada

Transports
Canada

Prairie and Northern Region - Aircraft Certification - RACD
800-1601 Airport Road NE
Calgary, Alberta T2E 6Z8

Phone: 403-292-4990
FAX: 403-292-4992

TC File: unassigned
Your File: 493

FAX MEMORANDUM (403) 250-8333

April 4, 2002

Aero Design Limited
1045 McTavish Road NE
Calgary, AB T2E 7G9
Attention: David Wagner

SUBJECT: Compliance Plan and means of substantiation – Bell 206 Attach Provision

Ted,

This letter is in response to your request for review and acceptance of the proposed compliance plan for the subject modification. The compliance program under review is CP493 at Rev 0, dated 12 March 2002.

The following paragraphs are applicable and should be included with the updated submission:

- FAR 27.305 – Strength and deformation
- FAR 27.571 – Fatigue
- FAR 27.865 – External load attach means

As you indicated during our review meeting, FAR27.865 would not apply for this case, therefore, please include a comment indicating the rationale for excluding this paragraph.

Your proposed means of substantiation through application of MIL-HDBK-5 design allowables for the base material of the saddle fitting, superimposed with the additional loads presented by the external attachment has been determined to be an acceptable means of determining required strength for this specific application. Although this approach will support the fitting, load path consideration, ie fitting attachment to the fuselage, will need to be determined through establishment of design allowables or physical tests of the structure. These considerations should also be identified in the comments associated with 27.307 Proof of Structure in CP493.

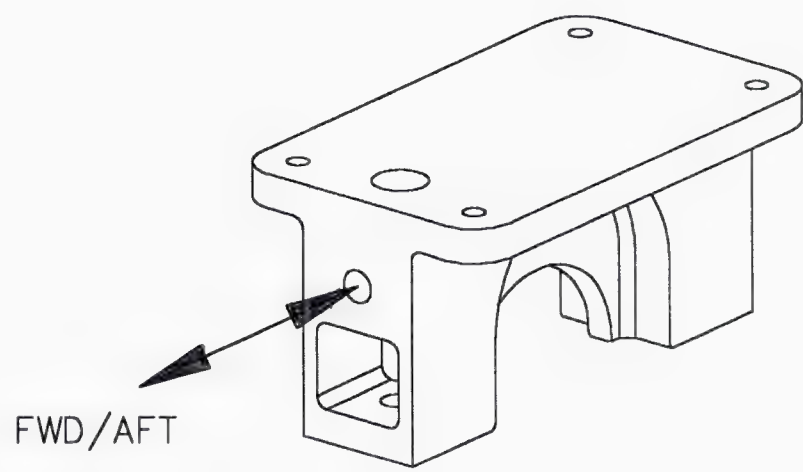
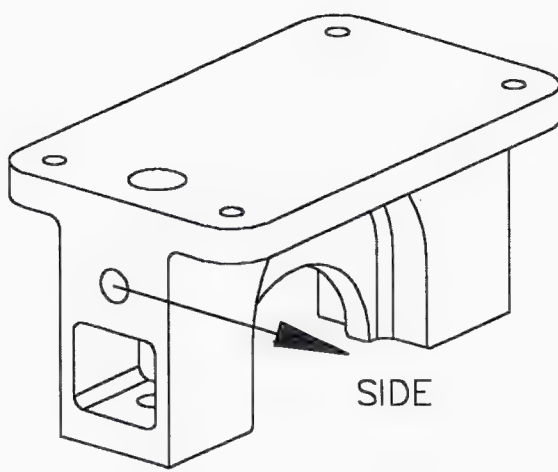
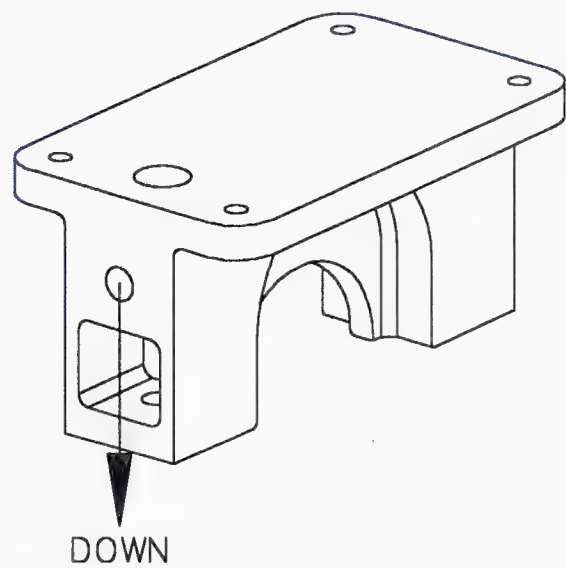
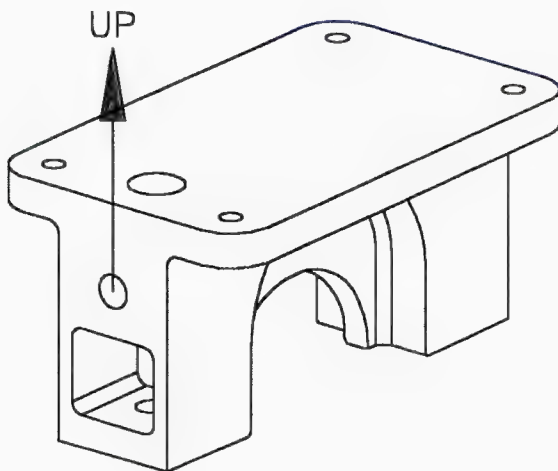
Given that this modification is for a "Provision" only, it is recommended that a draft certificate be included with the application and a statement of limitations be provided for TC acceptance prior to issuance of the final certificate.

Please feel free to call and discuss further at your convenience.

Greg Oucharek, P. Eng.
Aircraft Certification Engineer - Calgary TCC

DESIGN ALLOWABLE LOADS ~~ULTIMATE~~ ON EXTERNAL ATTACHMENT PROVISIONS

<u>MAINT MANUAL</u>		<u>LIMIT</u>	<u>ULT</u>
100 HK INSP.	UP	000 POUNDS	TBD
NO CHANGE	DOWN	000 POUNDS	TBD
HARD LANDING	FWD/AFT	000 POUNDS	TBD
RETURN TO AERO DESIGN FOR REPLACEMENT SET.	SIDE	000 POUNDS	TBD



HELICOPTER DROP TEST APPROXIMATION

Geometry of crosstubes simplified conservatively for analysis.

	Gross Weight of Bell 206L-4 Helicopter.	$W := 4450 \cdot \text{lbf}$
	Rotor Lift (Ref. 27.473).	$L := 2967 \cdot \text{lbf}$
	Acceleration due to gravity.	$g = 32.17 \cdot \frac{\text{ft}}{\text{sec}^2}$
	Acceleration toward the ground in drop.	$a := \frac{1}{3} \cdot g$
	Drop Test height. (FAR 27.725)	$h := 13 \cdot \text{in}$
	Reserve Energy Drop Test height.(FAR 27.727)	$h := 19.5 \cdot \text{in}$
$V_{\text{drop}} := \sqrt{2 \cdot a \cdot h}$	Landing Descent Speed in drop test.	$V_{\text{drop}} = 354 \cdot \frac{\text{ft}}{\text{min}}$
$PE := (W - L) \cdot h$	Potential Energy prior to drop.	$PE = 2410 \cdot \text{lbf} \cdot \text{ft}$
$KE := \left(\frac{1}{2}\right) \cdot \left(\frac{W}{g}\right) \cdot V_{\text{drop}}^2$	Kinetic Energy at Landing (check).	$KE = 2410 \cdot \text{lbf} \cdot \text{ft}$
$SE := KE$	Kinetic Energy of helicopter must be transformed into strain energy in the crosstubes to absorb impact.	$SE = 2410 \cdot \text{lbf} \cdot \text{ft}$

Longitudinal CG Limits & Weight Distribution

	Maximum forward cg at max. weight.	$cg_{\text{fwd}} := 119.4 \cdot \text{in}$
	Maximum aft cg at max. weight.	$cg_{\text{aft}} := 126.4 \cdot \text{in}$
	Position of front landing gear crosstube.	$x_{\text{fwd}} := 73.0 \cdot \text{in}$
	Position of aft landing gear crosstube.	$x_{\text{aft}} := 155.2 \cdot \text{in}$
$r_{cg_f} := \frac{cg_{\text{fwd}} - x_{\text{fwd}}}{x_{\text{aft}} - x_{\text{fwd}}}$	Proportion of max. weight on aft gear with max forward cg.	$r_{cg_f} = 56.4 \cdot \%$
$r_{cg_a} := \frac{cg_{\text{aft}} - x_{\text{fwd}}}{x_{\text{aft}} - x_{\text{fwd}}}$	Proportion of max. weight on aft gear with max aft cg.	$r_{cg_a} = 65.0 \cdot \%$

Lateral CG Limits & Weight Distribution

	Maximum left cg at max. weight.	$cg_{left} := 1.20 \cdot \text{in}$
	Maximum right cg at max. weight.	$cg_{right} := 1.61 \cdot \text{in}$
	Spacing of landing gear skid tubes.	$y_{gear} := 86 \cdot \text{in}$
$r_{cg_l} := \frac{1}{2} - \frac{cg_{left}}{y_{gear}}$	Proportion of max. weight on right gear with max left cg.	$r_{cg_l} = 48.6\%$
$r_{cg_r} := \frac{1}{2} + \frac{cg_{right}}{y_{gear}}$	Proportion of max. weight on right gear with max right cg.	$r_{cg_r} = 51.9\%$

Critical CG Position:

Location of the CG in drop test determines distribution of loads on 4 cross-tube legs.	$cg_{lon} := 65.0\%$
Critical Position is when CG is aft and right.	$cg_{lat} := 51.9\%$

Dimensions of Forward Cross Tube

	Outside Diameter.	$OD_f := 2.25 \cdot \text{in}$
	Wall Thickness of tube.	$t_f := 0.250 \cdot \text{in}$
$ID_f := OD_f - 2 \cdot t_f$	Inside Diameter.	$ID_f = 1.75 \cdot \text{in}$
$I_{fwd} := \frac{\pi}{64} \cdot (OD_f^4 - ID_f^4)$	Moment of Inertia.	$I_{fwd} = 0.798 \cdot \text{in}^4$
	Horizontal Length of crosstube leg from skid to fuselage attachment.	$L_{fwd} = 29.7 \cdot \text{in}$

Dimensions of Aft Cross Tube

	Outside Diameter.	$OD_a := 2.50 \cdot \text{in}$
	Wall Thickness of tube.	$t_a := 0.340 \cdot \text{in}$
$ID_a := OD_a - 2 \cdot t_a$	Inside Diameter.	$ID_a = 1.82 \cdot \text{in}$
$I_{aft} := \frac{\pi}{64} \cdot (OD_a^4 - ID_a^4)$	Moment of Inertia.	$I_{aft} = 1.38 \cdot \text{in}^4$
	Horizontal Length of crosstube leg from skid to fuselage attachment.	$L_{aft} := 32.8 \cdot \text{in}$

Properties of Cross Tube Material (7075-T6 Drawn Tube)

Modulus of Elasticity of 7075-T6
Aluminum Tubing.

$$E := 10.3 \cdot 10^6 \text{ psi}$$

Ultimate Tensile Strength of 7075-T6
Aluminum Tubing WW-T-700/7

$$F_{tu_7075T6} := 77 \text{ ksi}$$

Limit Tensile Strength of 7075-T6
Aluminum Tubing WW-T-700/7

$$F_{ty_7075T6} := 66 \text{ ksi}$$

D/t ratio for front crosstube.

$$\frac{OD_f}{t_f} = 9.00$$

Modulus of Rupture for aluminum
alloy round tubing
(Ref Mil-Hdbk-5H, Figure 3.11.1.1.1)

$$k_f := 1.36$$

D/t ratio for aft crosstube.

$$\frac{OD_a}{t_a} = 7.35$$

Modulus of Rupture for aluminum
alloy round tubing
(Ref Mil-Hdbk-5H, Figure 3.11.1.1.1)

$$k_a := 1.4$$

Forces Applied to Landing Gear

$$SE = 2410 \cdot \text{lb} \cdot \text{ft}$$

Total Strain Energy that must be developed to absorb energy of drop.

$$U := \frac{1}{2} \int_0^L \frac{M^2}{E \cdot I} dx$$

Bruhn, Page A.7.2, equation (5), Strain Energy of Flexure.
Kinetic Energy is absorbed by bending the crosstubes.

Where:

$$SE = 2 \cdot \frac{(P_{\text{aft}} \cdot L_{\text{aft}})^2 \cdot L_{\text{aft}}}{6 \cdot E \cdot I_{\text{aft}}} + 2 \cdot \frac{(P_{\text{fwd}} \cdot L_{\text{fwd}})^2 \cdot L_{\text{fwd}}}{6 \cdot E \cdot I_{\text{fwd}}}$$

Solving Integral using geometry shown in Figure 9.1.

Kinetic Energy absorbed is the sum of the Strain Energies produced in each cross tube.
The reaction load at each leg will be different, and must balance with the CG.

$$P_{\text{left_fwd}} = (1 - cg_{\text{lon}}) \cdot (1 - cg_{\text{lat}}) \cdot R$$

Reaction Load on front left cross tube.

$$P_{\text{right_fwd}} = (1 - cg_{\text{lon}}) \cdot (cg_{\text{lat}}) \cdot R$$

Reaction Load on front right cross tube.

$$P_{\text{left_aft}} = (cg_{\text{lon}}) \cdot (1 - cg_{\text{lat}}) \cdot R$$

Reaction Load on aft left cross tube.

$$P_{\text{right_aft}} = (cg_{\text{lon}}) \cdot (cg_{\text{lat}}) \cdot R$$

Reaction Load on aft right cross tube.

Then:

$$R := \sqrt{\frac{6 \cdot E \cdot SE}{\frac{[cg_{\text{lon}}^2 \cdot cg_{\text{lat}}^2 + cg_{\text{lon}}^2 \cdot (1 - cg_{\text{lat}})^2] \cdot L_{\text{aft}}^3}{I_{\text{aft}}} + \frac{[(1 - cg_{\text{lon}})^2 \cdot cg_{\text{lat}}^2 + (1 - cg_{\text{lon}})^2 \cdot (1 - cg_{\text{lat}})^2] \cdot L_{\text{fwd}}^3}{I_{\text{fwd}}}}$$

$$R = 15512 \cdot \text{lb} \cdot \text{f}$$

Total vertical reaction force on landing gear to arrest drop velocity.

$$n_{\text{drop}} := \frac{R}{W}$$

Acceleration due to Reaction Force.

$$n_{\text{drop}} = 3.49$$

Reaction Loads on Each Cross-Tube Leg

$$P_{rf} := (1 - cg_{lon}) \cdot (cg_{lat}) \cdot R$$

Reaction Load applied to right forward crosstube leg. $P_{rf} = 2818 \cdot \text{lb}$

$$P_{lf} := (1 - cg_{lon}) \cdot (1 - cg_{lat}) \cdot R$$

Reaction Load applied to left forward crosstube leg. $P_{lf} = 2612 \cdot \text{lb}$

$$P_{ra} := (cg_{lon}) \cdot (cg_{lat}) \cdot R$$

Reaction Load applied to right aft crosstube leg. $P_{ra} = 5233 \cdot \text{lb}$

$$P_{la} := (cg_{lon}) \cdot (1 - cg_{lat}) \cdot R$$

Reaction Load applied to left aft crosstube leg. $P_{la} = 4850 \cdot \text{lb}$

The reaction loads shown above apply only to the case where the CG of the helicopter is located at its aft and right limits. Higher loads on the forward cross-tube legs occur when the CG is farther forward, but do not become as great as the loads on the aft legs.

$$P_{max} := P_{ra}$$

Maximum load applied to cross-tube leg. $P_{max} = 5233 \cdot \text{lb}$

Each cross-tube leg is clamped to the bottom of the helicopter with a fitting.

$$P_{ftg} := P_{ra}$$

Maximum load applied to fitting. $P_{ftg} = 5233 \cdot \text{lb}$

Bearing Stress on Machined Fittings under Reserve Energy Drop Test Load (FAR 27.727)

$$w := 0.313 \cdot \text{in}$$

Dimensions of bearing area.

$$D := 2.63 \cdot \text{in}$$

$$A := D \cdot w$$

Cross-Tube Bearing Area on Fitting. $A = 0.82 \cdot \text{in}^2$

$$f_{br} := \frac{P_{ftg}}{A}$$

Bearing Stress Applied to Fitting. $f_{br} = 6.36 \cdot \text{ksi}$

$$F_{bru_6061} := 88 \cdot \text{ksi}$$

Ultimate Bearing Strength of 6061-T6.

$$MS := \frac{F_{bru_6061}}{f_{br}} - 1$$

Margin of Safety $MS = 12.8$

$$f_{nom} := \frac{W \cdot (cg_{lon} \cdot cg_{lat})}{A}$$

Nominal Stress on fitting when parked. $f_{nom} = 1.82 \cdot \text{ksi}$

Strength and Deflections of Landing Gear Due To Drop Test

$$\delta_{fwd} := \frac{P_{rf} L_{fwd}^3}{I_{fwd} E}$$

Deflection of front crosstube legs.

$$\delta_{fwd} = 9.0 \cdot \text{in}$$

$$f_{b_fwd} := \frac{P_{rf} L_{fwd} \frac{OD_f}{2}}{I_{fwd}}$$

Bending Stress Applied to front crosstube legs.

$$f_{b_fwd} = 118 \cdot \text{ksi}$$

$$F_{by} := F_{ty_7075T6} \cdot k_f$$

Bending Modulus of Rupture for 7075-T6 Drawn Tube.

$$F_{by} = 90 \cdot \text{ksi}$$

$$YMS := \frac{F_{by}}{f_{b_fwd}} - 1$$

Margin of Safety.

$$YMS = -0.24$$

Obviously, failure of the gear would not permit certification of the helicopter, (unless Bell showed through its "Equivalent Safety Finding" that failure of the gear did not pose a hazard to the rotorcraft). Having ignored the rotor lift in this calculation, exaggerated ground loads are applied. A more likely case is where the gear yields but does not fail. The gear deflection can be worked backwards to find a more realistic value.

$$\delta_{\text{certification}} := \delta_{fwd} (1 + YMS)$$

$$\delta_{\text{certification}} = 6.83 \cdot \text{in}$$

$$\delta_{aft} := \frac{P_{ra} L_{aft}^3}{I_{aft} E}$$

Deflection of aft crosstube legs.

$$\delta_{aft} = 13.0 \cdot \text{in}$$

$$f_{b_aft} := \frac{P_{ra} L_{aft} \frac{OD_a}{2}}{I_{aft}}$$

Bending Stress Applied to aft crosstube legs.

$$f_{b_aft} = 156 \cdot \text{ksi}$$

$$F_{by} := F_{ty_7075T6} \cdot k_a$$

Bending Modulus of Rupture for 7075-T6 Drawn Tube.

$$F_{by} = 92 \cdot \text{ksi}$$

$$YMS := \frac{F_{by}}{f_{b_aft}} - 1$$

Margin of Safety.

$$YMS = -0.41$$

$$\delta_{\text{certification}} := \delta_{aft} (1 + YMS)$$

$$\delta_{\text{certification}} = 7.72 \cdot \text{in}$$

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

F A X C O V E R S H E E T

DATE: April 5, 2002 TIME: 10:32 AM
TO: M&M Aerospace H/W PHONE: 310-900-1300
Pamela Horton FAX: 310-900-1319
FROM: S. Fahey PHONE: 403-250-8027
Aero Design Ltd. FAX: 403-250-8333

Number of pages including cover sheet: 1

RE: PRICE QUOTE

I would like a quote on the following items, noting which are in stock and which are not:

<u>AN Bolts:</u>		<u>NAS Bolts:</u>		<u>MS Nuts:</u>	
AN4-6A	50	NAS6204-9	25	MS21042L4	50
AN4-7A	50	NAS6204-25	25	MS21042L5	50
AN4-17A	50	NAS6604-10	25		
AN4-20A	50	NAS6605-11	25		
AN4-30A	50				
AN6-20A	50				
AN6-21A	50				

<u>AN Washers:</u>		<u>NAS Washers:</u>		<u>Barrel Nuts (w. retainer):</u>	
AN960JD10L	100	NAS1149D0463J	100	SPS 2752-064	25
AN960JD416L	100	NAS1149D0516J	100	SPS 2752-054	25
AN960JD516L	100			SPS 2752-048	25

Regards,
Steven Fahey

From :

PHONE No. : 00

Apr. 04 2002 4:18PM P01

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

FAX COVER SHEET

DATE: April 4, 2002 TIME: 4:01 PM
TO: Leavens PHONE: 735-4988
FAX: 735-4988
FROM: S. Fahey PHONE: 403-250-8027
Aero Design Ltd. FAX: 403-250-8333

Number of pages including cover sheet:

RE: PRICE QUOTE

Per our phone conversation, I would like a quote on the following items, noting which are in stock and which are not:

EA	AN Bolts:	NAS Bolts:	MS Nuts:
.28	AN4-8A ^{YVC} 50 ^{Box} 2-3 days	NAS6204-9 25 NQ	MS21042L4 50 2-3 days 124/E
.32	AN4-7A 45 50 2-3 days	NAS6204-25 25	MS21042L5 50 STK 163/E
.54	AN4-17A 50 2-3 days	NAS6604-10 25	
.54	AN4-20A 50 STK	NAS6605-11 25	
1.30	AN4-30A 50 2-3 days		
1.10	AN6-20A 10 50 2-3 days		
1.79	AN6-21A 5 50 2-3 wks		

	AN Washers:	NAS Washers:	
.04	AN980JD10L 100 2-3 days	NAS1149D0483J 100	NQ
.06	AN980JD416L 100 2-3 days	NAS1149D0516J 100	NQ
NQ	AN980JD516L 100	NS	

Regards,
Steven Fahey

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

F A X C O V E R S H E E T

DATE:	April 4, 2002	TIME:	4:01 PM
TO:	Leavens	PHONE:	735-4996
		FAX:	735-4998
FROM:	S. Fahey	PHONE:	403-250-8027
	Aero Design Ltd.	FAX:	403-250-8333

Number of pages including cover sheet:

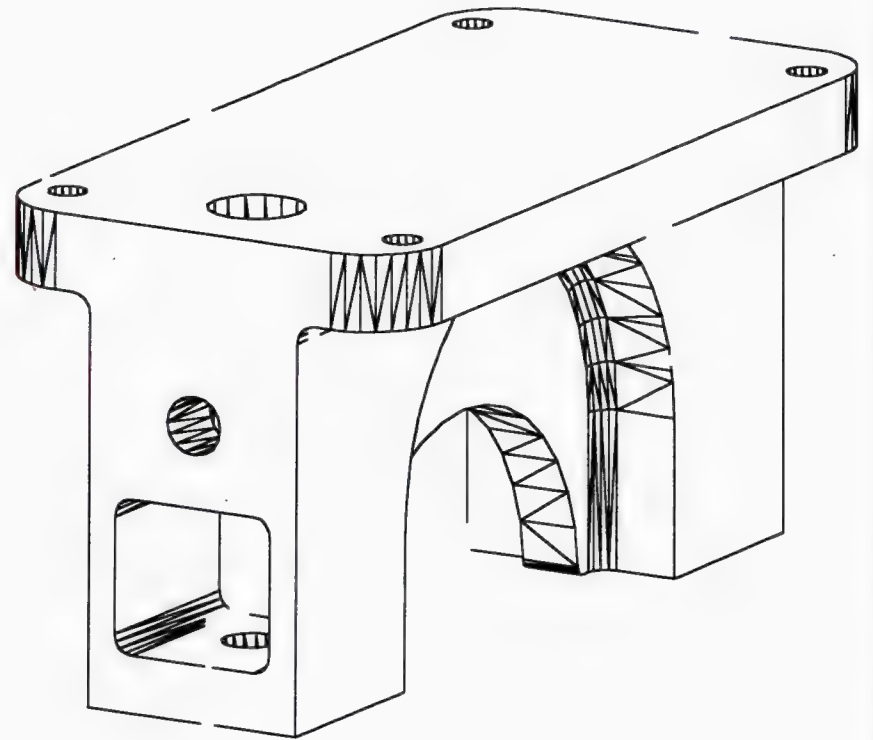
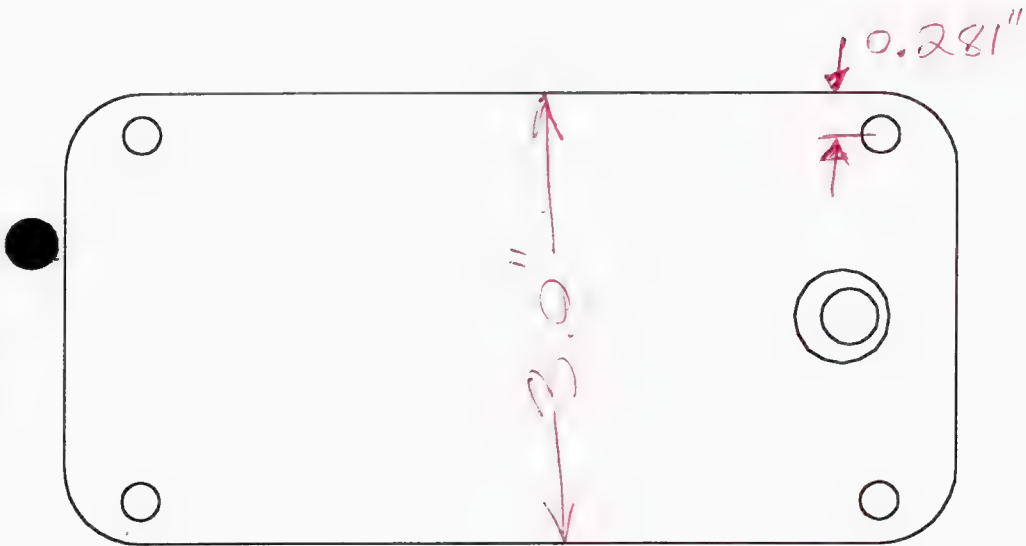
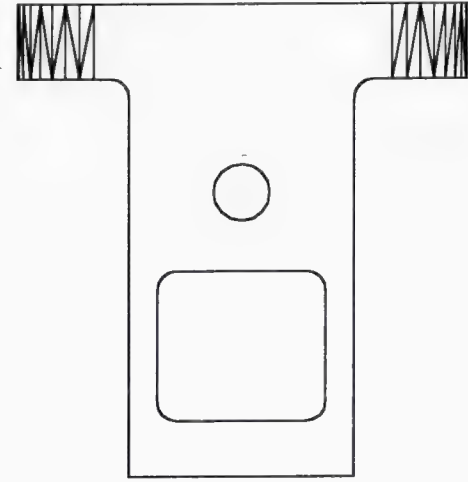
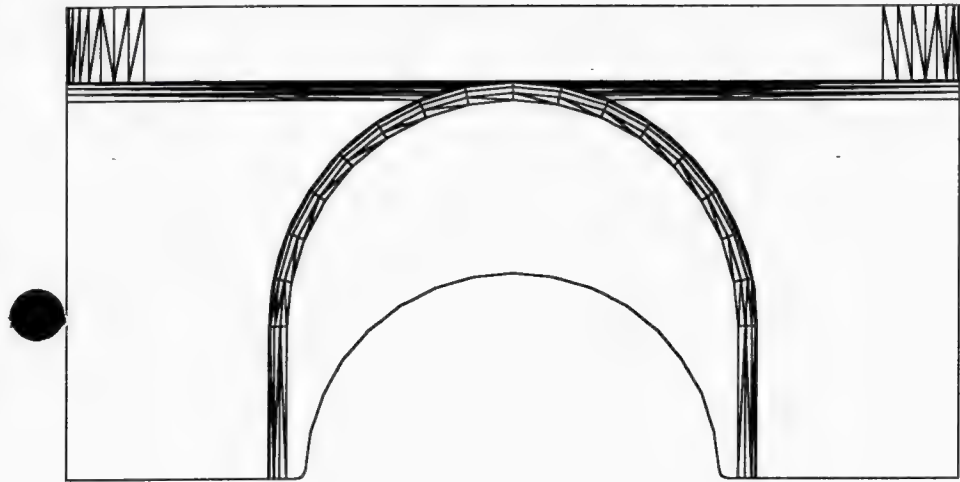
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AN4-17A	50	NAS6604-10	25		
AN4-20A	50	NAS6605-11	25		
AN4-30A	50				
AN6-20A	50				
AN6-21A	50				

<u>AN Washers:</u>		<u>NAS Washers:</u>	
AN960JD10L	100	NAS1149D0463J	100
AN960JD416L	100	NAS1149D0516J	100
AN960JD516L	100		

Regards,
Steven Fahey



	GRIP	LENGTH
NAS 6604-5	0.312	0.737
6604-14	0.875	1.300

AERO Design Ltd.

ENGINEERING REPORT ER493.01

BELL 206L SERIES

External Attachment Provisions

DRAFT



Approved: E. Burgoin, P. Eng.

Prepared by: S. Fahey

Date: 20 March, 2002

~~Revision 0~~

AERO Design Ltd.: Mailing Address: 1045 McTavish Road N E, Calgary Alberta T2E 7G9
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E-Mail: aerodsgn@telusplanet.net

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1.0 INTRODUCTION

The Landing gear legs on Bell 206L helicopters are attached to the fuselage with four bearing fittings. The forward and aft sets of fittings are very similar, except that they accommodate different sizes of cross-tubes.



Figure 1.1 L/H Aft Fitting

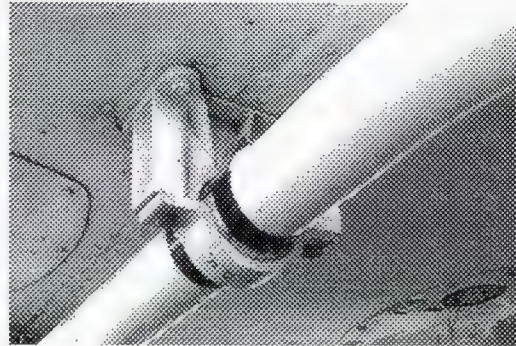


Figure 1.2 R/H Aft Fitting

Attempts in the past by various designers to mount equipment onto the fittings have been hampered by lack of space. This can be solved by designing a new landing gear fitting that incorporates convenient provisions to mount equipment.

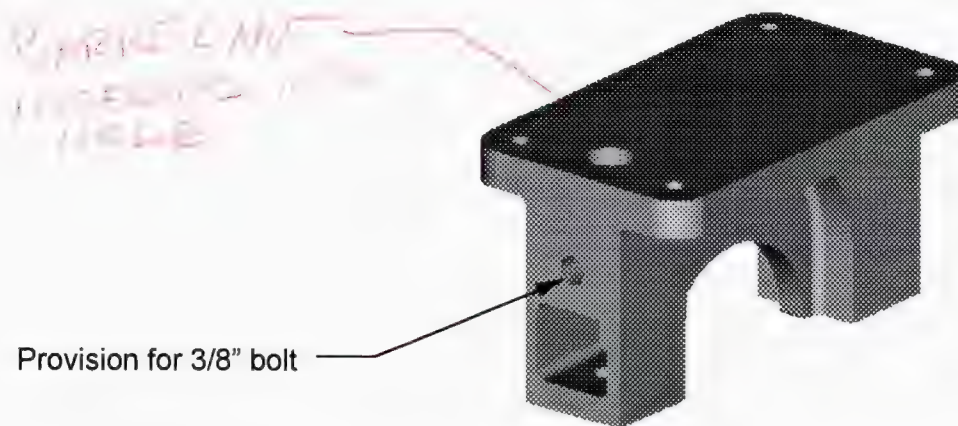


Figure 1.3 Provision for Attachment of External Equipment

2.0 REFERENCE

Bell 206L Illustrated Parts Manual

Bell 206L Maintenance Manual

Mil-Handbook-5H

3RUHJ

3.0 BASIS OF CERTIFICATION

To be applicable to all models of the 206L series, the certification basis of the 206L-4 is used:

Bell 206L-4	Canadian Type Approval	H-92
	FAA Type Certificate	H2SW

FAR Part 27 dated 2 October 1964 Amendment 27-1 thru 27-24 with:

27.79, 27.143, 27.173, 27.175, 27.1519, 27.1585, 27.1587 at Amdt 27-1;

27.1093, 27.1545 at Amdt 27-8;

27.45, 27.141, 27.1309 at Amdt 27-20;

27.2, 27.307, 27.337, 27.351, 27.427, 27.501, 27.571, 27.613, 27.629, 27.663, 27.674, 27.685, 27.727, 27.783, 27.807, 27.861, 27.865 at Amdt 27-28;

and 27.391, 27.395, 27.397, 27.681, 27.1357, 27.1361, replaced by 6.220, 6.225, 6.323, 6.623, 6.624, 6.625, 6.626 of CAR Part 6 dated 6 December 1956 Amendment 6-1 thru 6-4.

Exceptions to FAR 27 are the deletion of: 27.71, 27.177, 27.399, 27.562, 27.610, 27.954, 27.1195, 27.1322.

Equivalent Safety Findings:

1. Skid Landing Gear (Drop Test) FAR 27.723, 27.725, and 27.727
2. Fuel Tanks (Drop Test)- FAR 27.965(c)(1) and (c)(2). FAR Part 36 dated 3 November 1969 Amendment 36-1 thru 36-14, Subpart H.

4.0 ANALYSIS OF CURRENT AIRWORTHINESS DIRECTIVES (AD'S)

Airworthiness Directives applicable to the Bell 206L series have been reviewed and no conflicting AD's were found. See Appendix A.

5.0 ORIGINAL CAST MATERIAL STRENGTH

The original parts from Bell Helicopter;

Part Numbers: 206-033-108-001 (forward)

206-033-109-001 (aft)

are cast aluminum. It is ~~highly~~ likely that a high-strength casting alloy was used in their manufacture, and that tight quality control has been exercised.

It can, therefore, be reasonably assumed that the highest material strength properties have been attained for the aluminum alloy casting. Mil-Hdbk-5H specifies the following maximum strength values, in the designated areas for castings:

Table 5.1

ALLOY	Specification	F _{tu} (ksi)	F _{su} (ksi)	F _{bru} (e/D=2.0) (ksi)
A201	Mil-A-21180	60	36	122
354	Mil-A-21180	50	31	107
C355	Mil-A-21180	50	31	107
356	AMS 4260	25	16	53
A356	Mil-A-21180	45	28	96
A357	Mil-A-21180	50	31	107
D357	AMS 4241	49	31	105
359	Mil-A-21180	47	29	101

~~The casting alloy A201 has the highest allowable strength values, therefore this will be used as the basis of the strength comparison of the machined fitting.~~

6.0 MACHINED PROVISIONS MATERIAL STRENGTH

The fitting is machined from 6061-T651 aluminum plate. Mil-Hdbk-5H specifies the following allowable strength values:

Table 6.1

ALLOY	Specification	F _{tu} (ksi)	F _{su} (ksi)	F _{bru} (e/D=2.0) (ksi)
6061-T651	QQ-A-250/11	42	27	88

7.0 COMPARISON OF MATERIAL

Comparison of the properties of the cast alloy with the 6061 shows the following relative strength:

Table 5.3

	F _{tu} (ksi)	F _{su} (ksi)	F _{bru} (ksi)
STRENGTH COMPARISON	70%	75%	72%

7.0 DIMENSIONAL COMPARISON

The machined fitting is dimensionally similar enough to the original part to ensure interchangeability, but material is thicker in places to increase strength. Figure 7.1 below shows specific dimensions that have been enlarged.

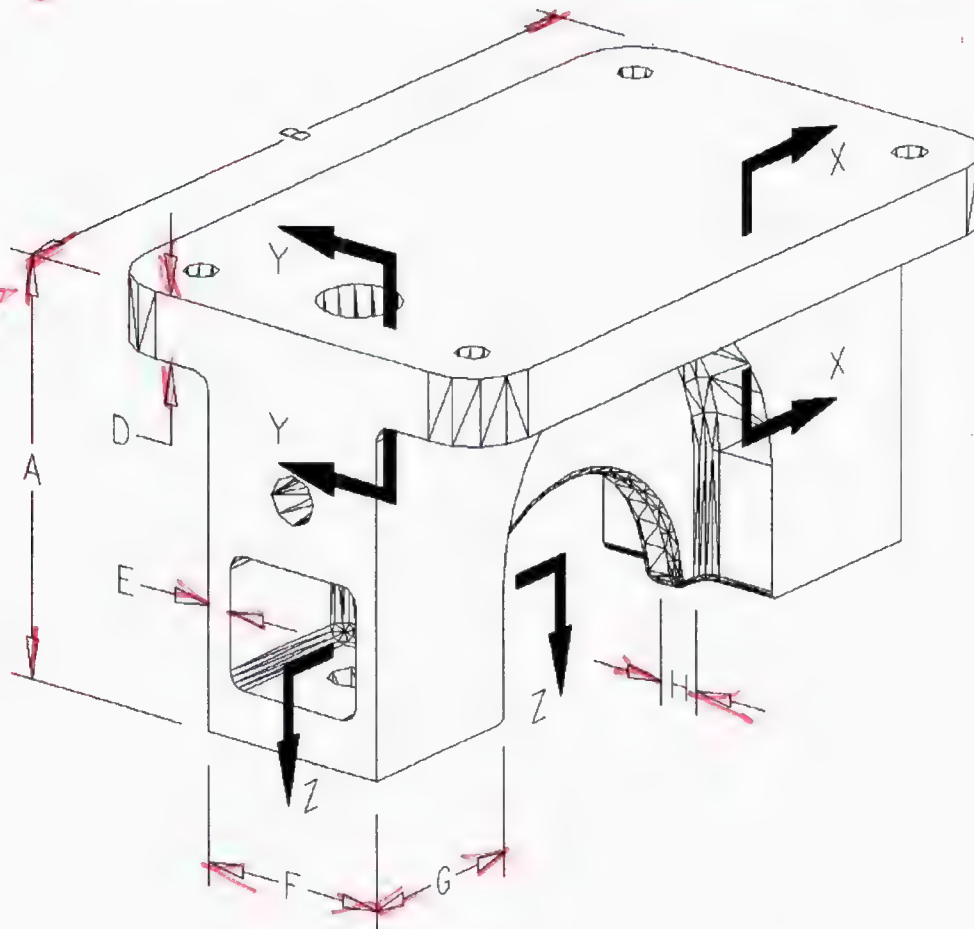


Figure 7.1 Key Dimensions of Fitting

(X-SECTION = MAIN
IN FIG. 8.2)

Table 7.1

Dimension	Original Cast Part	Machined Part
A	3.15 2.90	3.15 2.90
B	5.88	5.88
D	0.30 0.25	0.50 0.25
E	1.313	1.500
F	0.125	0.188
G	1.313	1.438
H	0.300	0.313

Dimensions A and B are identical, to make the parts interchangeable with the originals. Dimensions D through H, however are slightly greater than on the original part. The extra thickness does not interfere with the function of the fittings, nor with their fit on the helicopter.

The impact of these beefed-up areas is shown below in Figure 7.2, where the cross-sectional properties are developed.

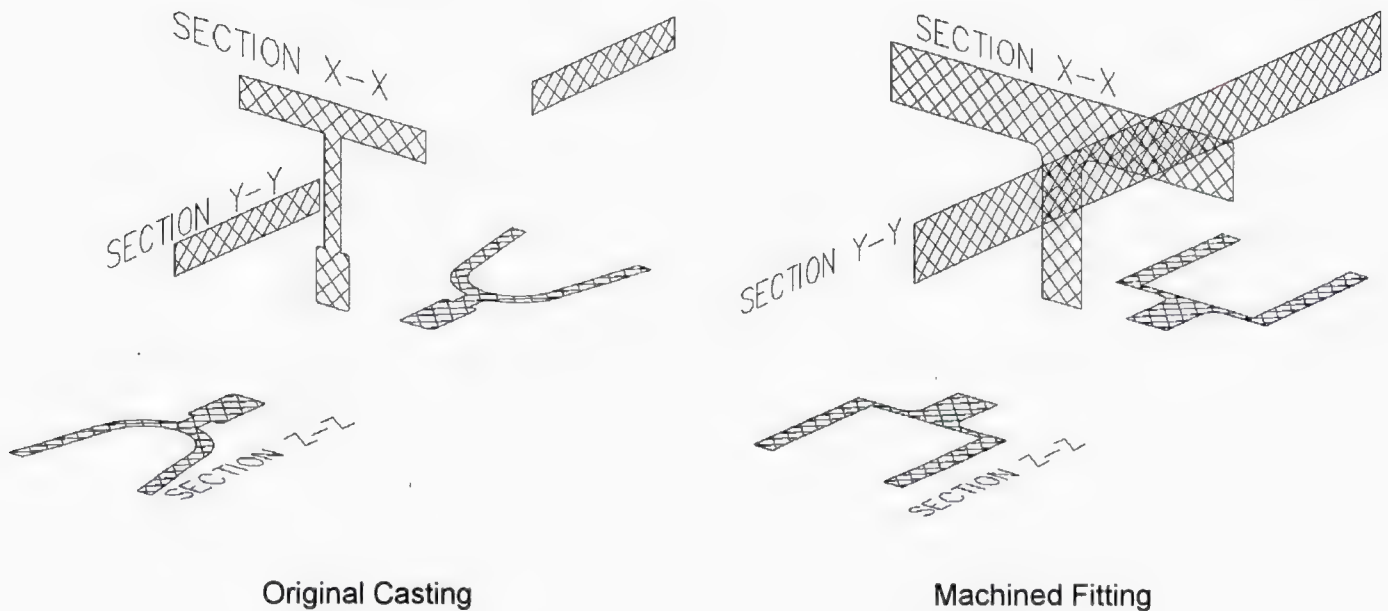


Figure 7.2 Cross Sections of Fittings

Table 7.2

SECTION	CROSS-SECTIONAL AREA (in ²)	MAJOR AXIS SECTION MODULUS (in ³)	MINOR AXIS SECTION MODULUS (in ³)
Original Casting (Weight = 0.69 lb)			
X-X	0.720	0.117 0.130	0.0652 0.168
Y-Y	0.847	0.671	0.0176
Z-Z	1.13	0.768	0.108
Machined Part (Weight = 1.96 lb)			
X-X	2.37 1.51	0.507 0.521	0.238 0.233
Y-Y	2.94 1.47	1.44 0.72	0.122 0.0304
Z-Z	2.06	1.24	0.347
Comparison (284% heavier)			
X-X	329%	433%	363%
Y-Y	347%	215%	295%
Z-Z	182%	161%	321%

8.0 STRENGTH COMPARISON OF PARTS

The 6061-T6 material is, at worst, 70% as strong as the original cast alloy.

The machined parts has sectional properties at least 61% better than the original part.

Therefore: $(0.70) \times (1.61) = 1.13$

Under all of the various loads the fitting will experience in service, the machined fitting is greater in strength than the original part.

Margin of Safety is Positive

9.0 LANDING LOAD

Bell used an "Equivalent Safety Finding" in certifying its landing gear to meet FAR 27.723, 27.725, and 27.727. This data is not published.

Instead, a brief analysis of the loads imparted to the landing gear fittings during a drop test can be done using the principles of conservation of energy. All of the Potential Energy gained in raising the helicopter to the required height will be transformed into Kinetic Energy as it falls. All of this Kinetic Energy will be transformed into Strain Energy as the landing gear deflects. This analysis is conservative when rotor lift is ignored, and the full gross weight is applied.

INCLUDE
LIFT FOR A
REALISTIC
ANALYSIS

$$V_{\text{drop}} := \sqrt{2 \cdot g \cdot h}$$

$$PE := W \cdot h$$

$$KE := \left(\frac{1}{2}\right) \cdot \left(\frac{W}{g}\right) \cdot V_{\text{drop}}^2$$

$$SE := KE$$

Gross Weight of Bell 206L-4 Helicopter.

$$W := 4450 \text{ lbf}$$

Acceleration due to gravity.

$$g = 32.17 \frac{\text{ft}}{\text{sec}^2}$$

Drop Test height. (FAR 27.725)

$$h := 13 \text{ in}$$

Reserve Energy Drop Test height. (FAR 27.727)

$$h := 19.5 \text{ in}$$

Landing Descent Speed in drop test.

$$V_{\text{drop}} = 614 \frac{\text{ft}}{\text{min}}$$

Potential Energy prior to drop.

$$PE = 7231 \cdot \text{lbf} \cdot \text{ft}$$

Kinetic Energy at Landing (check).

$$KE = 7231 \cdot \text{lbf} \cdot \text{ft}$$

Kinetic Energy of helicopter must be transformed into strain energy in the crosstubes to absorb impact.

$$SE = 7231 \cdot \text{lbf} \cdot \text{ft}$$

Longitudinal CG Limits & Weight Distribution

Maximum forward cg at max. weight.

$$cg_{\text{fwd}} := 119.4 \text{ in}$$

Maximum aft cg at max. weight.

$$cg_{\text{aft}} := 126.4 \text{ in}$$

Position of front landing gear crosstube.

$$x_{\text{fwd}} := 73.0 \text{ in}$$

Position of aft landing gear crosstube.

$$x_{\text{aft}} := 155.2 \text{ in}$$

$$r_{cg_f} := \frac{cg_{fwd} - x_{fwd}}{x_{aft} - x_{fwd}}$$

Proportion of max. weight on aft gear with max forward cg.

$$r_{cg_f} = 56.4\%$$

$$r_{cg_a} := \frac{cg_{aft} - x_{fwd}}{x_{aft} - x_{fwd}}$$

Proportion of max. weight on aft gear with max aft cg.

$$r_{cg_a} = 65.0\%$$

Lateral CG Limits & Weight Distribution

Maximum left cg at max. weight.

$$cg_{left} := 1.20 \text{ in}$$

Maximum right cg at max. weight.

$$cg_{right} := 1.61 \text{ in}$$

Spacing of landing gear skid tubes.

$$y_{gear} := 86 \text{ in}$$

$$r_{cg_l} := \frac{1}{2} - \frac{cg_{left}}{y_{gear}}$$

Proportion of max. weight on right gear with max left cg.

$$r_{cg_l} = 48.6\%$$

$$r_{cg_r} := \frac{1}{2} + \frac{cg_{right}}{y_{gear}}$$

Proportion of max. weight on right gear with max right cg.

$$r_{cg_r} = 51.9\%$$

Critical CG Position:

Location of the CG in drop test determines distribution of loads on 4 cross-tube legs. Critical Position is when CG is aft and right.

$$cg_{lon} := 65.0\%$$

$$cg_{lat} := 51.9\%$$

Dimensions of Forward Cross Tube

Outside Diameter.

$$OD_f := 2.25 \text{ in}$$

Wall Thickness of tube.

$$t_f := 0.188 \text{ in}$$

$$ID_f := OD_f - 2 \cdot t_f$$

Inside Diameter.

$$ID_f = 1.87 \text{ in}$$

$$I_{fwd} := \frac{\pi}{64} \cdot (OD_f^4 - ID_f^4)$$

Moment of Inertia.

$$I_{fwd} = 0.653 \cdot \text{in}^4$$

Horizontal Length of crosstube leg from skid to fuselage attachment.

$$L_{fwd} := 29.7 \text{ in}$$

Dimensions of Aft Cross Tube

	Outside Diameter.	$OD_a := 2.50 \text{ in}$
	Wall Thickness of tube.	$t_a := 0.250 \text{ in}$
$ID_a := OD_a - 2 \cdot t_a$	Inside Diameter.	$ID_a = 2.00 \text{ in}$
$I_{aft} := \frac{\pi}{64} \cdot (OD_a^4 - ID_a^4)$	Moment of Inertia.	$I_{aft} = 1.13 \text{ in}^4$
	Horizontal Length of crosstube leg from skid to fuselage attachment.	$L_{aft} := 32.8 \text{ in}$

Properties of Cross Tube Material (7075-T6 Drawn Tube)

Modulus of Elasticity of 7075-T6 Aluminum Tubing.	$E := 10.3 \cdot 10^6 \text{ psi}$
Ultimate Tensile Strength of 7075-T6 Aluminum Tubing WW-T-700/7	$F_{tu_7075T6} := 77 \text{ ksi}$
Limit Tensile Strength of 7075-T6 Aluminum Tubing WW-T-700/7	$F_{ty_7075T6} := 66 \text{ ksi}$
D/t ratio for front crosstube.	$\frac{OD_f}{t_f} = 11.97$
Modulus of Rupture for aluminum alloy round tubing (Ref Mil-Hdbk-5H, Figure 3.11.1.1.1)	$k_f := 1.36$
D/t ratio for aft crosstube.	$\frac{OD_a}{t_a} = 10.00$
Modulus of Rupture for aluminum alloy round tubing (Ref Mil-Hdbk-5H, Figure 3.11.1.1.1)	$k_a := 1.4$

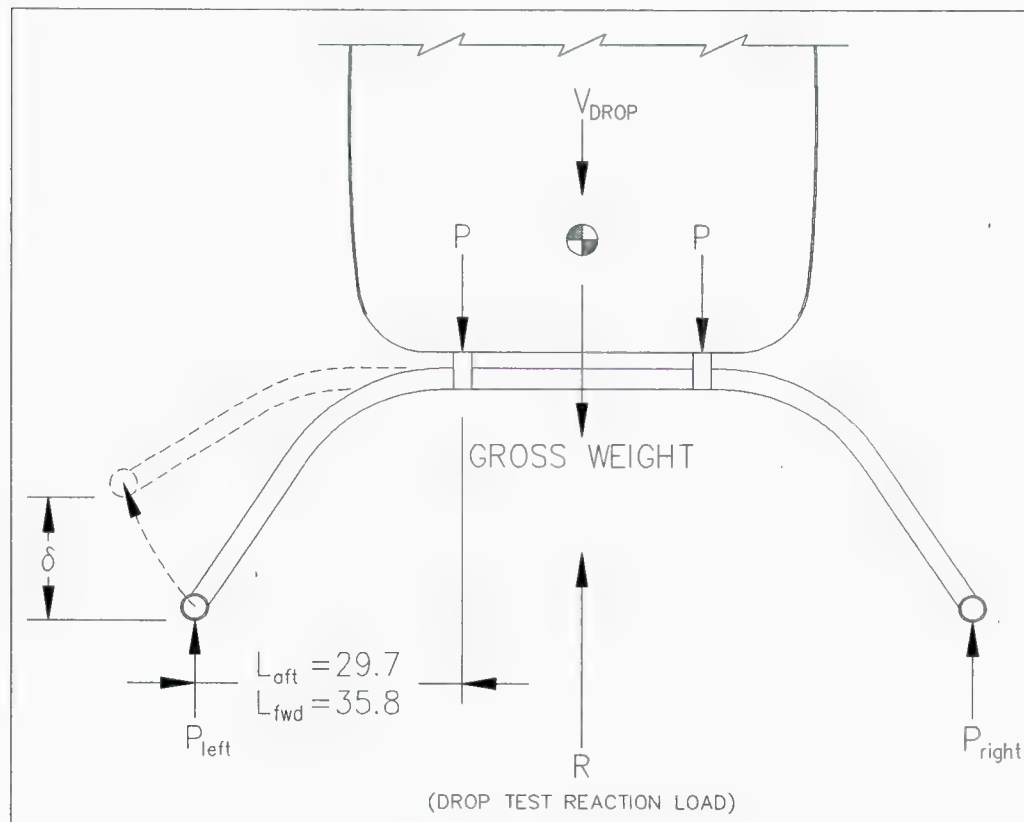


Figure 9.1 Drop Test Loads

Forces Applied to Landing Gear

$$SE = 7231 \cdot \text{lb} \cdot \text{ft}$$

Total Strain Energy that must be developed to absorb energy of drop.

$$U := \frac{1}{2} \int_0^L \frac{M^2}{EI} dx$$

Bruhn, Page A.7.2, equation (5), Strain Energy of Flexure. Kinetic Energy is absorbed by bending the crosstubes.

Where:

$$SE = 2 \cdot \frac{(P_{aft} \cdot L_{aft})^2 \cdot L_{aft}}{6 \cdot EI_{aft}} + 2 \cdot \frac{(P_{fwd} \cdot L_{fwd})^2 \cdot L_{fwd}}{6 \cdot EI_{fwd}}$$

Solving Integral using geometry shown in Figure 9.1.

Kinetic Energy absorbed is the sum of the Strain Energies produced in each cross tube. The reaction load at each leg will be different, and must balance with the CG.

$$P_{\text{left_fwd}} = (1 - \text{cg}_{\text{lon}}) \cdot (1 - \text{cg}_{\text{lat}}) \cdot R$$

Reaction Load on front left cross tube.

$$P_{\text{right_fwd}} = (1 - \text{cg}_{\text{lon}}) \cdot (\text{cg}_{\text{lat}}) \cdot R$$

Reaction Load on front right cross tube.

$$P_{\text{left_aft}} = (\text{cg}_{\text{lon}}) \cdot (1 - \text{cg}_{\text{lat}}) \cdot R$$

Reaction Load on aft left cross tube.

$$P_{\text{right_aft}} = (\text{cg}_{\text{lon}}) \cdot (\text{cg}_{\text{lat}}) \cdot R$$

Reaction Load on aft right cross tube.

Then:

$$R := \sqrt{\frac{6 \cdot E \cdot SE}{\left[\frac{\text{cg}_{\text{lon}}^2 \cdot \text{cg}_{\text{lat}}^2 + \text{cg}_{\text{lon}}^2 \cdot (1 - \text{cg}_{\text{lat}})^2}{I_{\text{aft}}} \cdot L_{\text{aft}}^3 + \frac{(1 - \text{cg}_{\text{lon}})^2 \cdot \text{cg}_{\text{lat}}^2 + (1 - \text{cg}_{\text{lon}})^2 \cdot (1 - \text{cg}_{\text{lat}})^2}{I_{\text{fwd}}} \cdot L_{\text{fwd}}^3 \right]}}$$

$$R = 24334 \cdot \text{lbf}$$

Total vertical reaction force on landing gear to arrest drop velocity.

$$n_{\text{drop}} := \frac{R}{W}$$

Acceleration due to Reaction Force.

$$n_{\text{drop}} = 5.47$$

Reaction Loads on Each Cross-Tube Leg

$$P_{\text{rf}} := (1 - \text{cg}_{\text{lon}}) \cdot (\text{cg}_{\text{lat}}) \cdot R$$

Reaction Load applied to right forward crosstube leg.

$$P_{\text{rf}} = 4420 \cdot \text{lbf}$$

$$P_{\text{lf}} := (1 - \text{cg}_{\text{lon}}) \cdot (1 - \text{cg}_{\text{lat}}) \cdot R$$

Reaction Load applied to left forward crosstube leg.

$$P_{\text{lf}} = 4097 \cdot \text{lbf}$$

$$P_{\text{ra}} := (\text{cg}_{\text{lon}}) \cdot (\text{cg}_{\text{lat}}) \cdot R$$

Reaction Load applied to right aft crosstube leg.

$$P_{\text{ra}} = 8209 \cdot \text{lbf}$$

$$P_{\text{la}} := (\text{cg}_{\text{lon}}) \cdot (1 - \text{cg}_{\text{lat}}) \cdot R$$

Reaction Load applied to left aft crosstube leg.

$$P_{\text{la}} = 7608 \cdot \text{lbf}$$

The reaction loads shown above apply only to the case where the CG of the helicopter is located at its aft and right limits. Higher loads on the forward cross-tube legs occur when the CG is farther forward, but do not become as great as the loads on the aft legs.

$$P_{\max} := P_{ra}$$

Maximum load applied to cross-tube leg.

$$P_{\max} = 8209 \cdot \text{lbf}$$

Each cross-tube leg is clamped to the bottom of the helicopter with a fitting.

$$P_{\text{ftg}} := P_{ra}$$

Maximum load applied to fitting.

$$P_{\text{ftg}} = 8209 \cdot \text{lbf}$$

Bearing Stress on Machined Fittings under Reserve Energy Drop Test Load (FAR 27.727)

Dimensions of bearing area.

$$w := 0.313 \text{ in}$$

$$D := 2.63 \text{ in}$$

$$A := D \cdot w$$

Cross-Tube Bearing Area on Fitting.

$$A = 0.82 \cdot \text{in}^2$$

$$f_{br} := \frac{P_{\text{ftg}}}{A}$$

Bearing Stress Applied to Fitting.

$$f_{br} = 9.97 \cdot \text{ksi}$$

Ultimate Bearing Strength of 6061-T6.

$$F_{bru_6061} := 88 \cdot \text{ksi}$$

$$MS := \frac{F_{bru_6061}}{f_{br}} - 1$$

Margin of Safety

$$MS = 7.8$$

APPENDIX A

TITLE OF APPENDIX

AIRWORTHINESS DIRECTIVES

Applicable to Canadian registered or manufactured aeronautical products

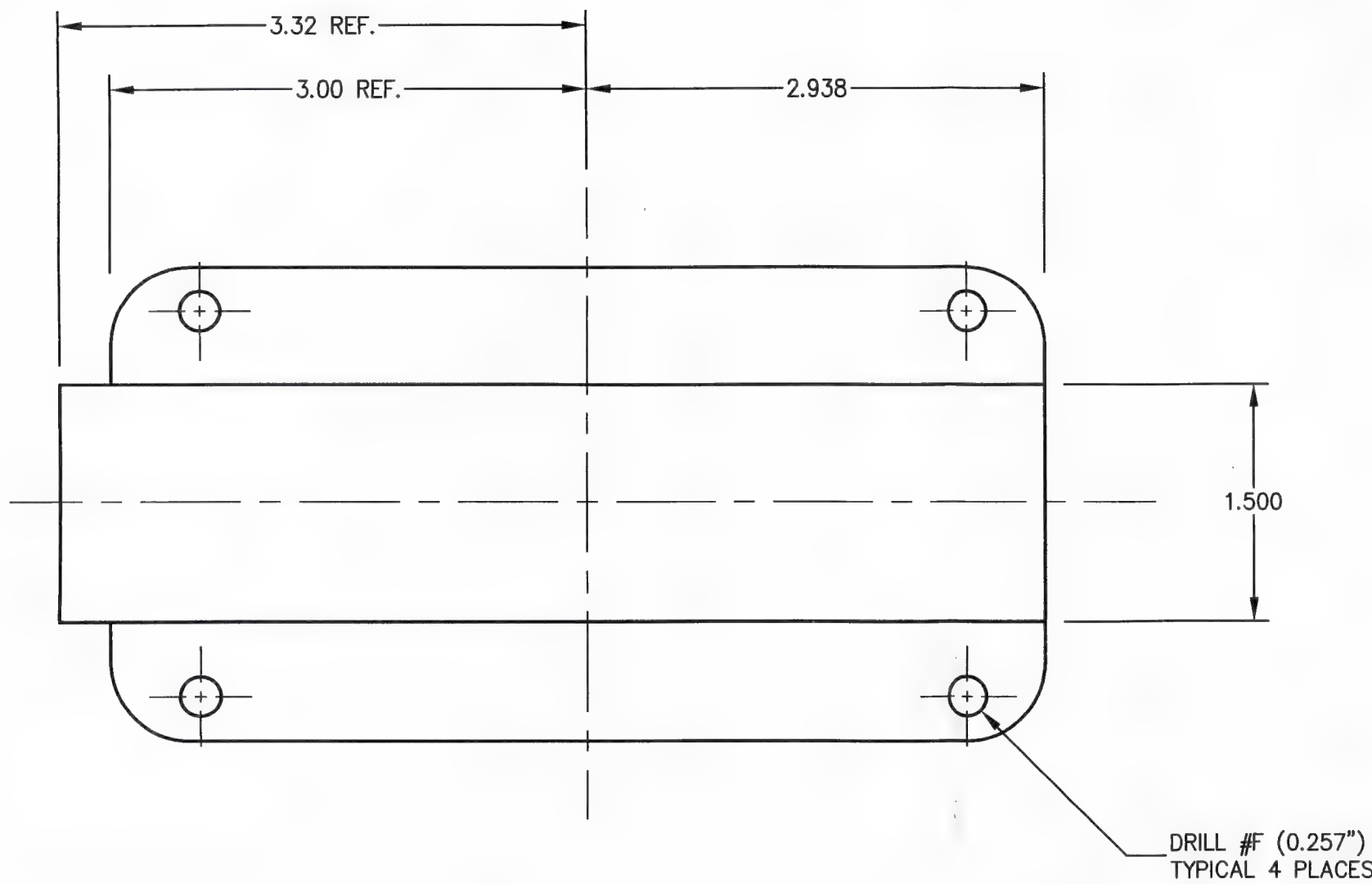
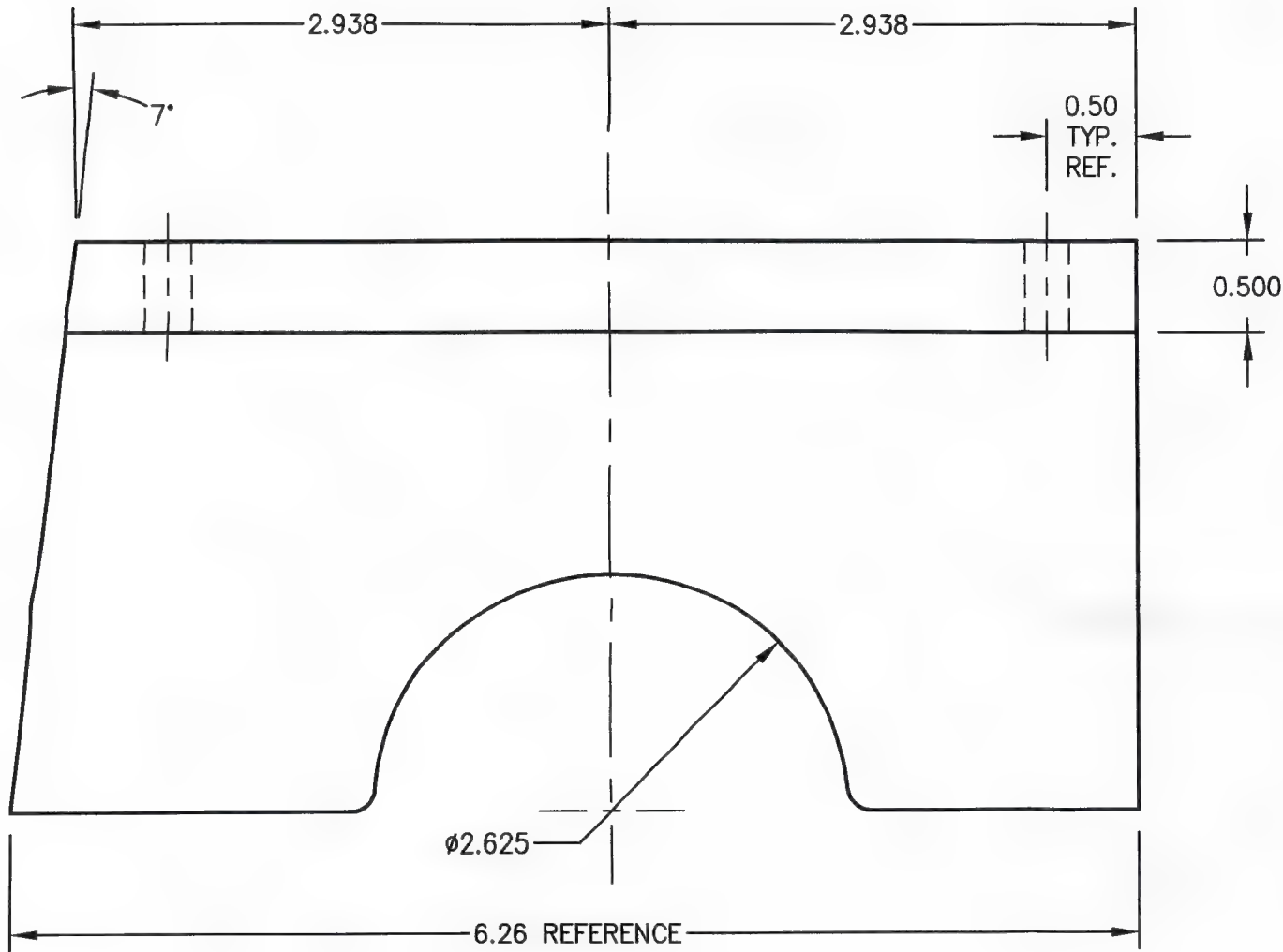
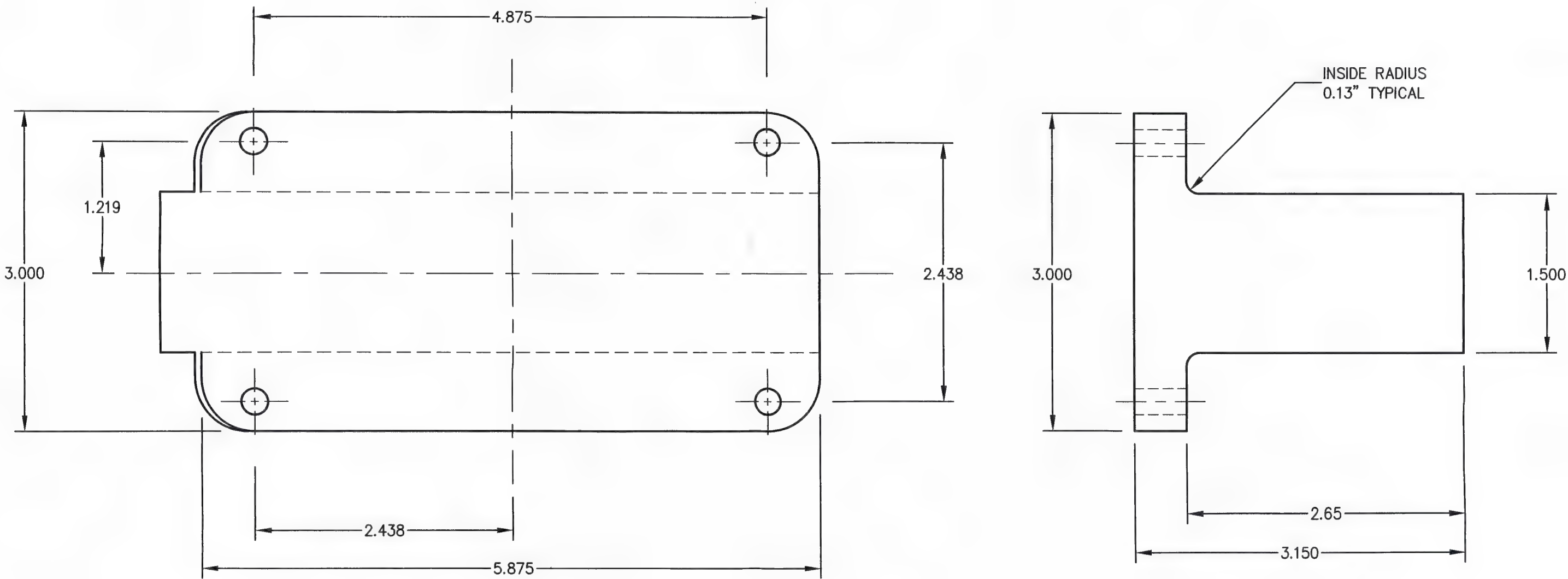
Database Last Updated: 2002-03-16

Directives Pertaining to Model: **BELL, 206L**

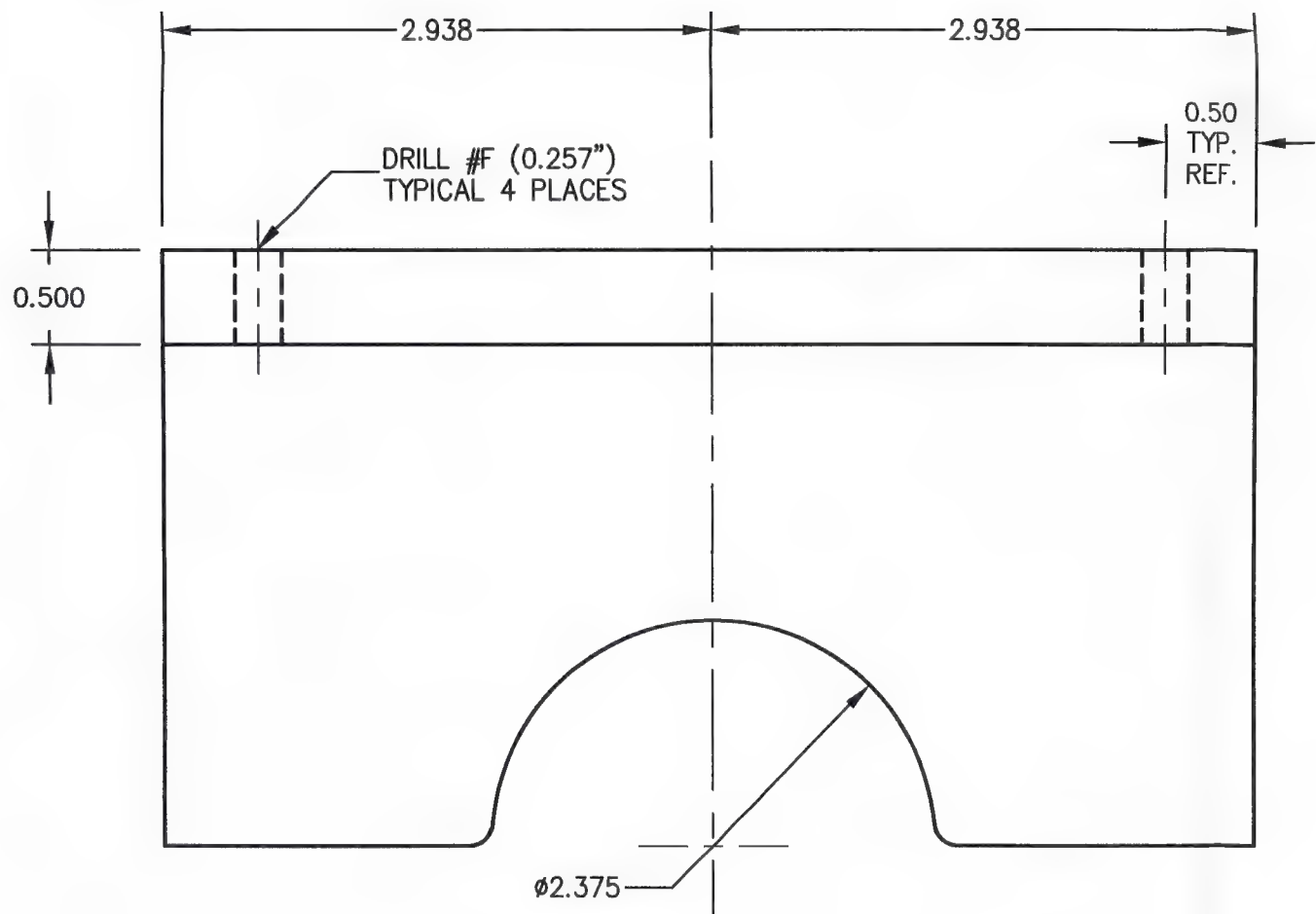
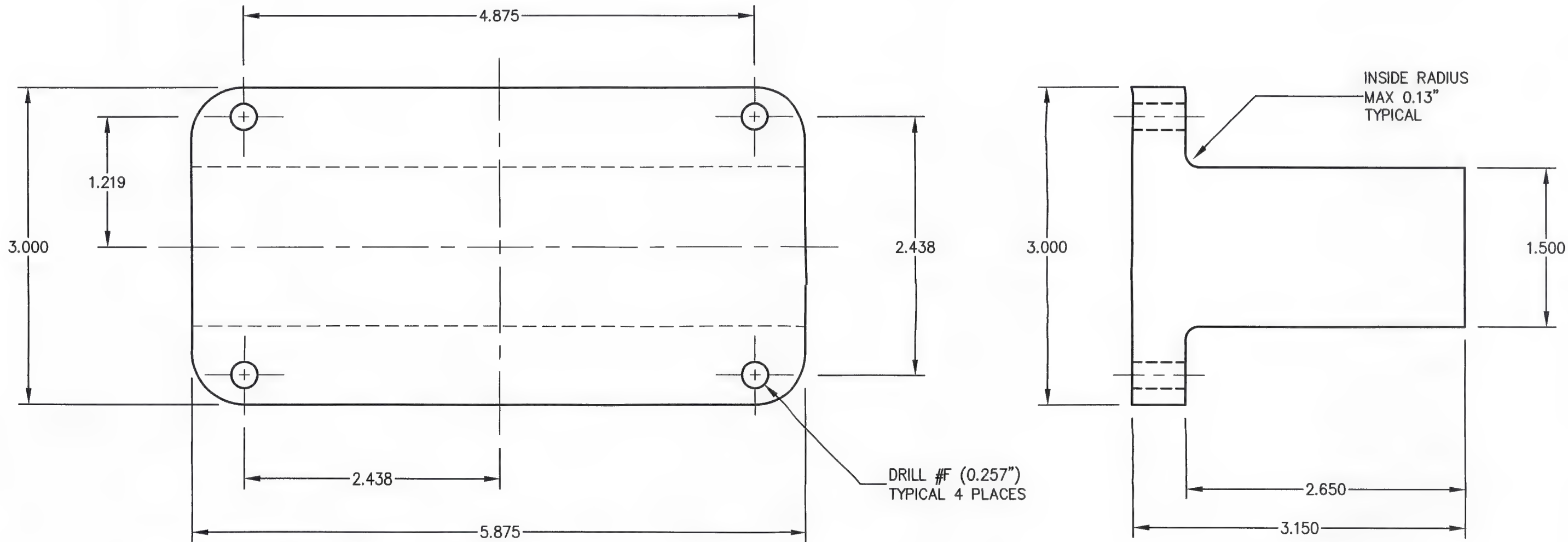
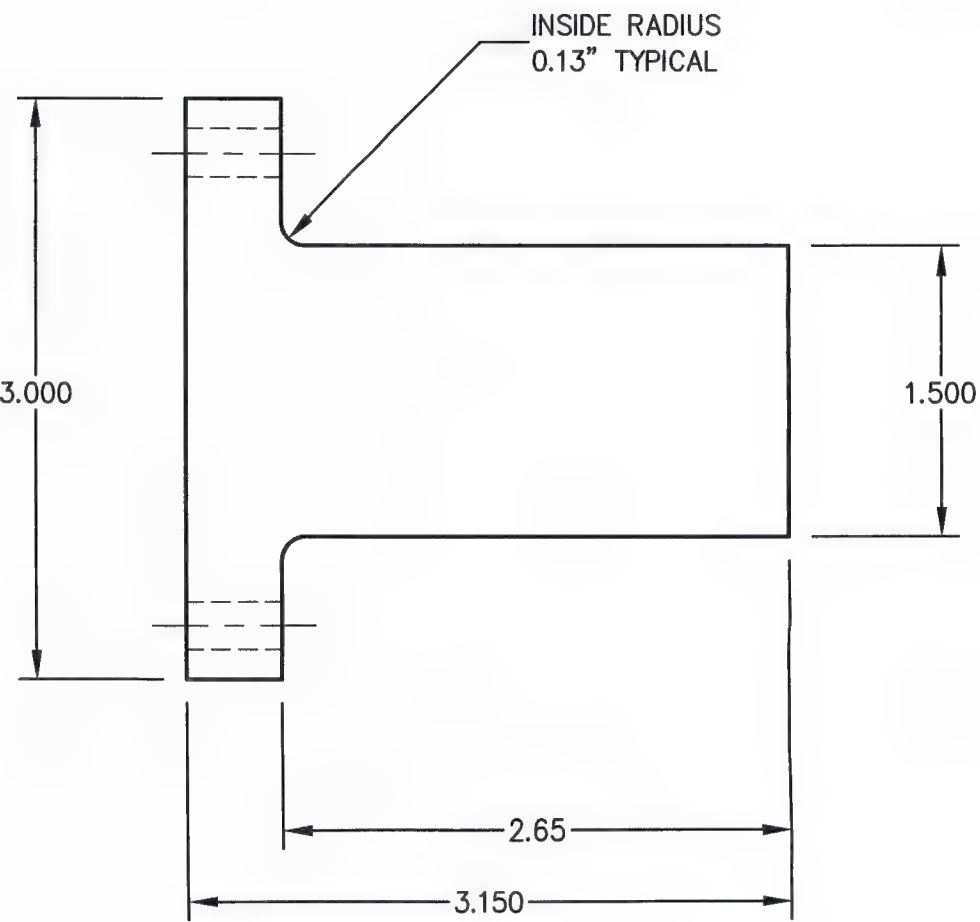
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Country:	AD Number:	AD Subject:	SB Reference:
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CF	<u>CF-2001-13</u>	SOLOY ENGINE RPM SENSOR	SOLOY 02-680R2
CF	<u>CF-2000-13</u>	COLLECTIVE LEVER - RAISED FORGING BOSS	ASB 206-00-93
CF	<u>CF-98-43</u>	CROSSTUBE ASSEMBLIES	
CF	<u>CF-98-27</u>	TAILBOOM MODIFICATION	ASB 206L-87-47 REV C
CF	<u>CF-98-15</u>	EXTERNAL RESCUE SYSTEMS	CAR 702.21
CF	<u>CF-1998-42R4</u>	CRACKED TAIL BOOM SKIN	206L-99-115 REV E
CF	<u>CF-97-03</u>	MAST AND TRUNNION RETIREMENT LIFE	
CF	<u>CF-96-11</u>	FUEL CELL VENT TUBE - WATER INGESTION	206-95-156
CF	<u>CF-95-19</u>	TEMP-PLATES OVERHEAT INDICATORS	ASB 206L-93-91 REV B
CF	<u>CF-95-17</u>	CROSSTUBE FAILURES	AA-ASB 94045/94046
CF	<u>CF-95-11R2</u>	UNAPPROVED BOLTS, FLIGHT CONTROL SERVO ACTUATORS	206-67-02,206-67A-01
US	<u>95-09-06</u>	INADVERTANT FUEL VALVE SWITCH POSITIONING	206-90-54/206L-90-67
US	<u>94-24-11</u>	TAIL ROTOR DRIVESHAFT MISALIGNMENT	206-92-69/206L-92-84
US	<u>94-20-03</u>	MAIN ROTOR HUB TRUNNION	206L-93-90
US	<u>94-19-02</u>	SWASHPLATE SUPPORT ASSEMBLY	206-93-74 REV B
US	<u>94-15-07</u>	MAIN ROTOR BLADES CRACKS	ASB 206-93-77
US	<u>92-06-12</u>	MAIN TRANSMISSION SUNGEAR	206-90-56,206L-90-69
US	<u>92-01-05</u>	MAIN ROTOR BLADES (FALSIFIED COMPONENT RECORDS)	
US	<u>91-23-15</u>	ENGINE RPM SENSOR	SOLOY 02-680
US	<u>91-03-12</u>	EMERGENCY FLOAT BAGS	206L-89-63,206-89-49
US	<u>90-21-03</u>	TAIL ROTOR BLADE TIP WEIGHT	
US	<u>90-13-01R1</u>	TAIL ROTOR BLADES	
US	<u>89-22-01R1</u>	MAIN ROTOR BLADES	
US	<u>89-20-13</u>	HORIZONTAL STABILIZER	
US	<u>88-26-03</u>	FUEL SYSTEM FLOW SWITCHES	206L-88-52
US	<u>88-23-03</u>	TAIL ROTOR YOKE ASSEMBLY	
US	<u>87-10-11</u>	MAIN ROTOR MAST	206-87-37, -44
US	<u>86-24-01</u>	TAIL ROTOR YOKE	
US	<u>85-26-06</u>	TAIL ROTOR BLADES	
US	<u>85-25-01</u>	CYCLIC CONTROL STICK	206-85-29,206L-85-36
US	<u>85-09-04</u>	MAIN ROTOR BLADES	ASB 206L-85-35
US	<u>83-03-04</u>	CHECK OF SHEAR HEADS-FLOAT INFLATION VALVES	SB 206L-81-21
US	<u>82-16-12</u>	WITH CHADWICK C-22 AFS PER STC SH139W	CHADWICK SB 20-81-01
US	<u>82-05-03</u>	HORIZONTAL STABILIZER ASSEMBLY	ASB 206L-81-23 REV A
US	<u>80-18-04R1</u>	MAIN ROTOR TRUNNION	ASB 206L-80-9 REV A
US	<u>80-17-05</u>	TAIL ROTOR BLADES	
US	<u>78-24-06R1</u>	HORIZONTAL STABILIZER	
US	<u>78-11-02R1</u>	M/R BLADE STRAPS	
US	<u>76-14-05</u>	FUEL SYSTEM COMPONENTS	

NOTICE			
THIS DRAWING CONTAINS INFORMATION AND DATA WHICH IS PROPRIETARY TO AERO DESIGN LTD. THIS DRAWING, OR ANY PORTION THEREOF, MAY NOT BE REPRODUCED, COPIED, OR DUPLICATED IN ANY MANNER, NOR USED FOR MANUFACTURING WITHOUT THE WRITTEN CONSENT OF AERO DESIGN LTD. BY ACCEPTING THIS DRAWING FOR REFERENCE, THE RECIPIENT AGREES TO HOLD AERO DESIGN LTD. HARMLESS FROM THE USE, OR MISUSE, OF THIS DRAWING OR THE INFORMATION CONTAINED THEREON.			
REV.	DESCRIPTION OF CHANGE	INITIALS	DATE
0	CREATED FROM 49301 AND 49302	STF	MAR 26/02



02 AFT FITTING



01 FORWARD FITTING

- NOTES:
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
 2. THOROUGHLY CLEAN, EPOXY PRIME, AND PAINT PART PRIOR TO ASSEMBLY.

2	49300-02	02	AFT FITTING	6061-T651 ALUMINUM	QQ-A-250/11	3" PLATE
2	49300-01	01	FWD FITTING	6061-T651 ALUMINUM	QQ-A-250/11	3" PLATE
PART NO.		ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.	STOCK SIZE
QTY.	LIST OF MATERIALS					
APPROVALS		DATE		AERO DESIGN LTD. ENGINEERING CONSULTANTS 1045 McTAVISH ROAD N.E. CALGARY, ALBERTA T2E 7G9		
DRAWN: STEVEN FAHEY		MAR 26/02				
CHECKED:						
STRESS:						
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON:				BELL 206L SERIES EXTERNAL ATTACHMENT PROVISIONS FWD AND AFT FITTINGS - LASER CUT		
DECIMALS		ANGLES		SCALE 1 : 1	DWG. SIZE	DWG. NO.
X.XXX ±0.010		±1/2"		A1	49300L	REV. 0
X.XX ±0.03						
X.X ±0.1						
X ±0.1				SHEET 1 OF 1		

AERO DESIGN LTD.
ENGINEERING CONSULTANTS
1045 McTAVISH ROAD N.E.
CALGARY, ALBERTA T2E 7G9

BELL 206L SERIES
EXTERNAL ATTACHMENT PROVISIONS
FWD AND AFT FITTINGS – LASER CUT

NEED REAL FITTINGS IN HAND TO VERIFY
MEASUREMENTS + FIX DRAWINGS 49301 & 49302.

- IF MEASUREMENTS CHANGE, THEN
STRENGTH COMPARISON WILL ALSO

\$4.20/LB 4" PIECE $4\frac{1}{4}" \times 15\frac{1}{4}"$ ALSO IN STOCK
~~195LB $32" \times 15\frac{1}{4}"$ \$819~~

$3" \times 19\frac{3}{4}" \times 7\frac{3}{4}"$ \$220 ORDERED

CAN MAKE 6 PIECES

LETTER TO J.C.

- HAS FLIGHT TEST BEEN DONE ON 4/2 BEAR PAWS?

CALL EMS IN EDMONTON

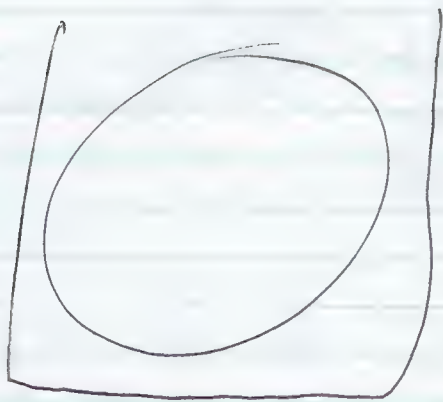
FAX QUOTES ON 6061-T6 PLATE QQ-A-250/11

3" THICK x 48" x 48" WIDE
3 1/2" THICK x 48" x 48" WIDE

FAXING

~~AND SAME IN 2024-T3 PLATE QQ-A-250/15.~~

METAL SUPERMARKET 720-2267



DAN HAMMER

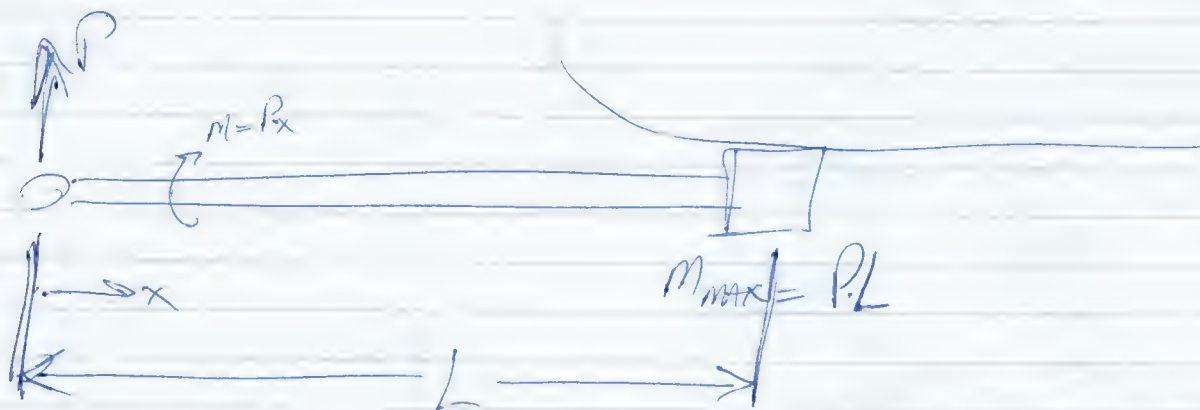
5 GAL. DRUM FITS
IN A 15" X 15" BASKET
WILL CALL NEXT WEEK,
WANTS TO KNOW COST!

JACK STAAL

- SEPARATE STC
- HAS DWGS OF ROUND LID! oops.
- WILL SEND WRITTEN REPLY TO C.P. SOON
- SAME OLD "MAST BENDING" CONCERN.

$$SE = \frac{P_L F^2 L_F^3}{6EI_{FWD}} + \frac{P_R F^2 L_F^3}{6EI_{FWD}} + \frac{P_{LA}^2 L_A^3}{6EI_{AFT}} + \frac{P_{RA}^2 L_A^3}{6EI_{AFT}}$$

$$U = \frac{1}{2} \int_0^{L_F} \frac{M^2}{EI} dx = \frac{1}{2} \int_0^{L_F} \frac{(P \cdot x)^2}{EI} dx$$



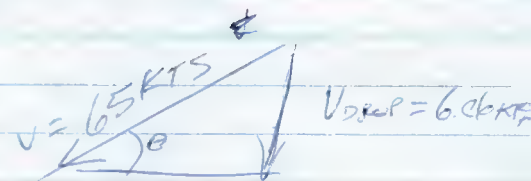
$$U = \frac{1}{2} \cdot \frac{P_x^2}{3EI} \Big|_0^{L_F} = \frac{P^2 L_F^3}{6EI}$$

$$F = \frac{1}{4}R \rightarrow SE = \frac{\frac{1}{16} R^2 L_F^3}{6EI} = \frac{R^2 L_F^3}{96EI}$$

$$\sqrt{\frac{96 \cdot E \cdot SE}{\left(\frac{L_F^3}{I}\right)}} = R$$

AUTO ROTATING DESCENT

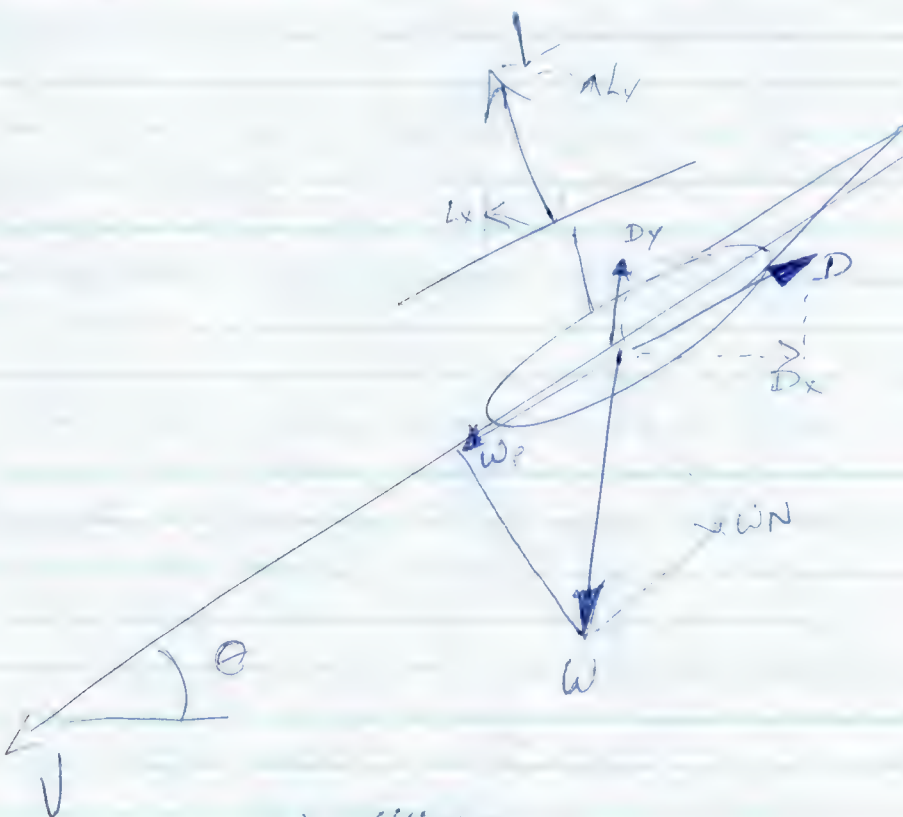
- FORCES ARE IN BALANCE IN THIS CASE



$$\sin \theta = \frac{D_P}{V}$$

$$\theta = \sin^{-1}\left(\frac{6.46}{65}\right)$$

$$\theta = 5.35^\circ$$



$$W = 4450 \text{ LB}$$

$$\theta = 5.35^\circ$$

CONSTANT SPEED

$$D = W_P = W \sin \theta = (4450) (\sin 5.35^\circ) = 415 \text{ LB}$$

$$D_y = D \sin \theta = 38.7 \text{ LB}$$

$$L = W_N = W \cos \theta = 4431 \text{ LB}$$

$$L_y = L \cos \theta = 4411 \text{ LB}$$

$$W - L_y + D_y = 4450 - 4411 - 39 = 0 \text{ LB BALANCE}$$

$$W = G.W. = 4450 \text{ LB}$$

$$h = 13 \text{ IN} \times 1.5$$

$$L = \frac{2}{3}$$

$$d = 7 \text{ IN (MAX BEFORE TUBE FAILS)}$$

$$n_s = ?? \text{ (SAT, 5.0)}$$

$$W_e = 4450 \text{ LB} \left[\frac{19.5 + (1 - \frac{2}{3})(7)}{7 + 19.5} \right] = 4450(0.821) = 3666.25$$

$$n = n_s \frac{3666}{4450} + L = 5(0.821) + \frac{2}{3} = \cancel{4.79} = 4.79$$

WHY IS THIS USEFUL?

Christina
4.20/lb

3 - 2 1/2
6061 - T
2024 - T

2024-T
3" - 9 3/4 x 48 T3 142 lb.
2 weeks \$590.00

3" 6061 T6
19 3/4 x 7 3/4 - \$220
46 lb. \$4.80

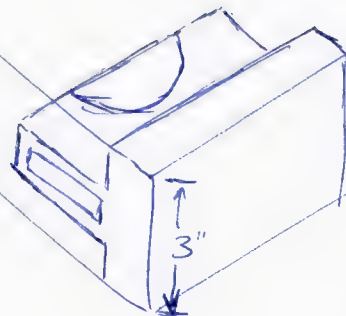
3 1/2 - 3 weeks - 10 week.
12 x 48 3 weeks
\$1800.00

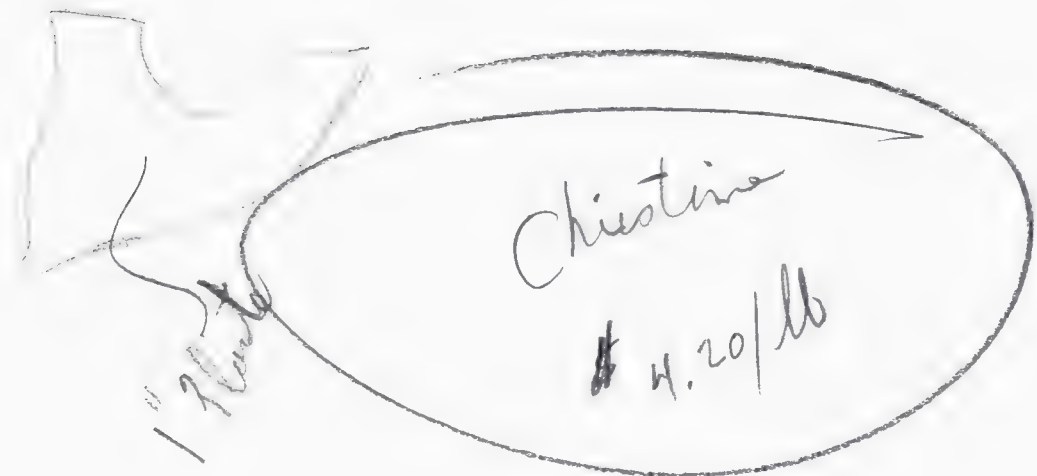
3 1/2
6061 T6
3 weeks.

24 Pcs.

LASER EQUATIONS SAYS 3" OK.

WATER JET CAN CUT UP TO 8" STEEL





3 - 3 1/2
 6061 - T
 2024 - T

2024-T
 3" - 9 3/4 x 48 T3
 142 lb.
 2 weeks \$590⁰⁰

3" 6061 T6
 19 3/4 x 7 3/4 - \$220
 46 lb. \$4.80

3 1/2 - 3 weeks - 10 week.
 12 x 48 3 who⁰⁰
 \$1800.

3 1/2
 6061 T6
 3 weeks.

2.9
 2.14



24 Pcs.

1400, 550 - 6th Avenue
Calgary, Alberta, T2P 0S2
Tel: (403) 624 3244
Fax: (403) 232 6750

Vallance & Co.

Fax

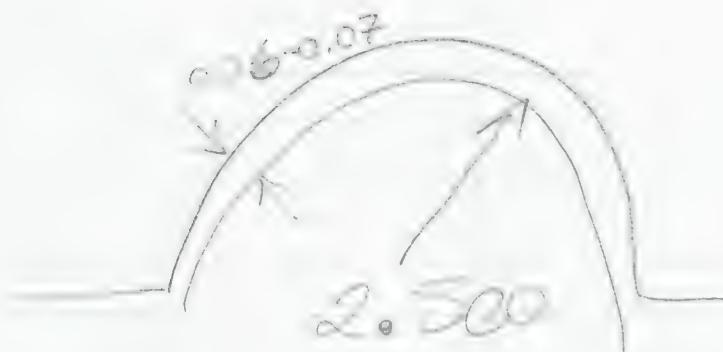
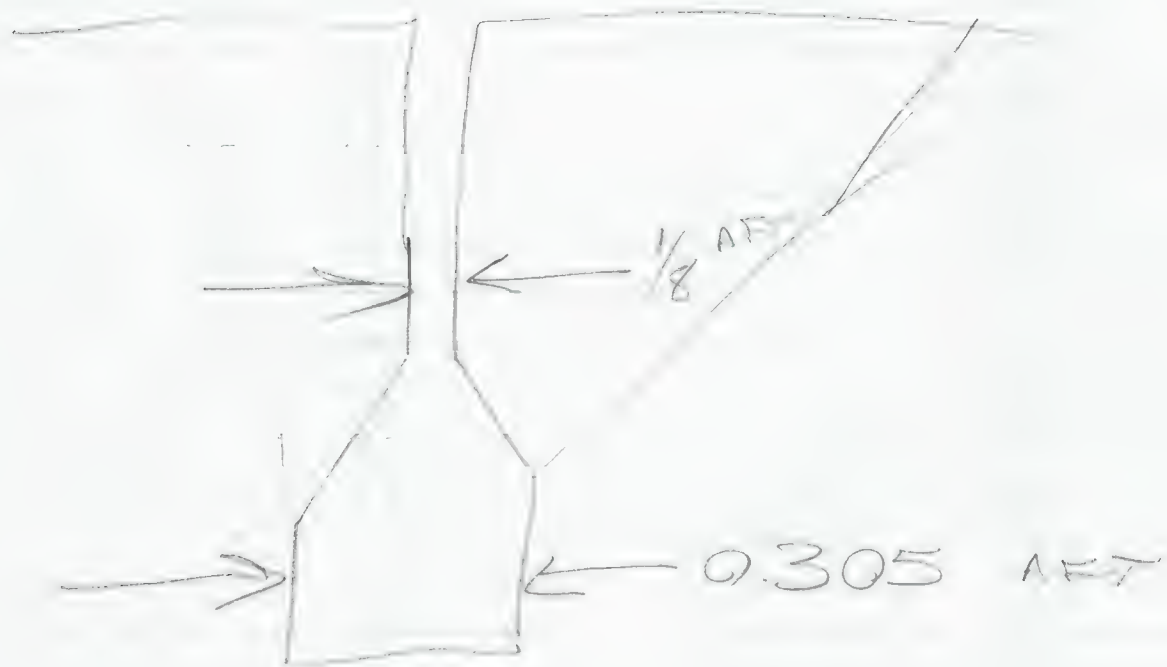
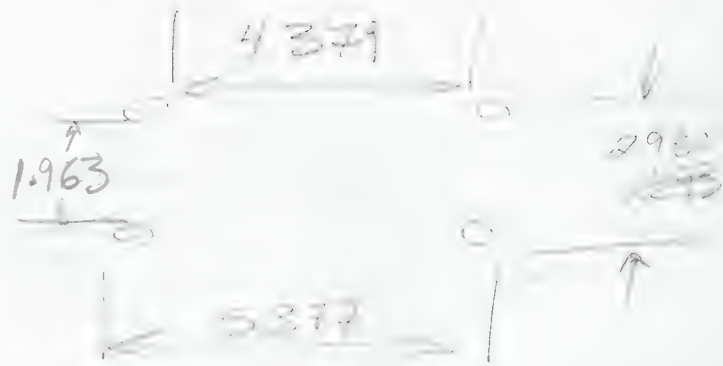
To: Ted Burgoin **From:** David Vallance
Firm: **Pages:** 2 (including this one)
Fax: 250 8333 **Date:** March 11, 2002
Re: **CC:**
☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

If you do not receive all the pages, please call back as soon as possible to the following number
(403) 264-3244 (Main Switchboard) **ATTN:** Sue

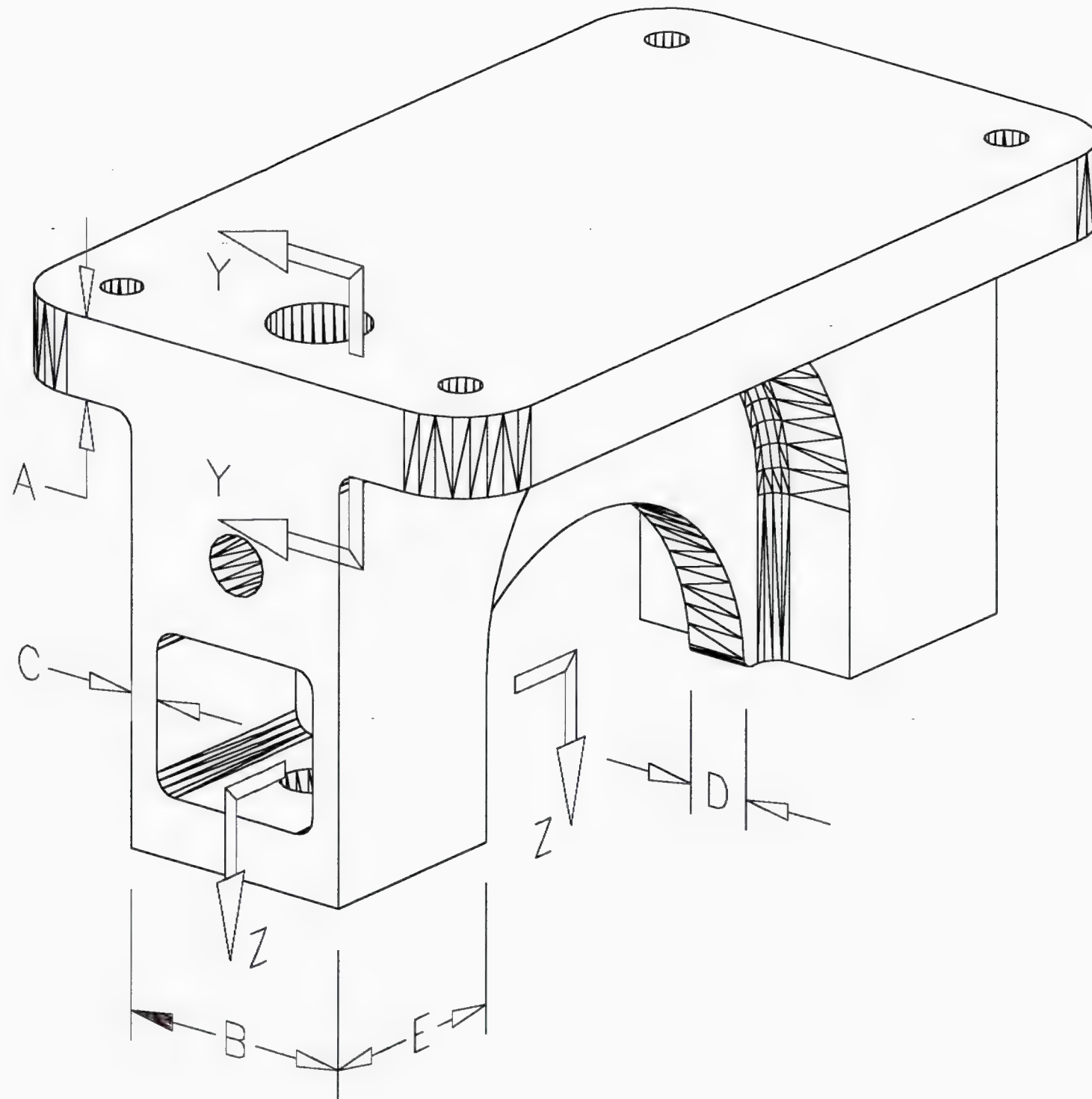
• **Comments:**

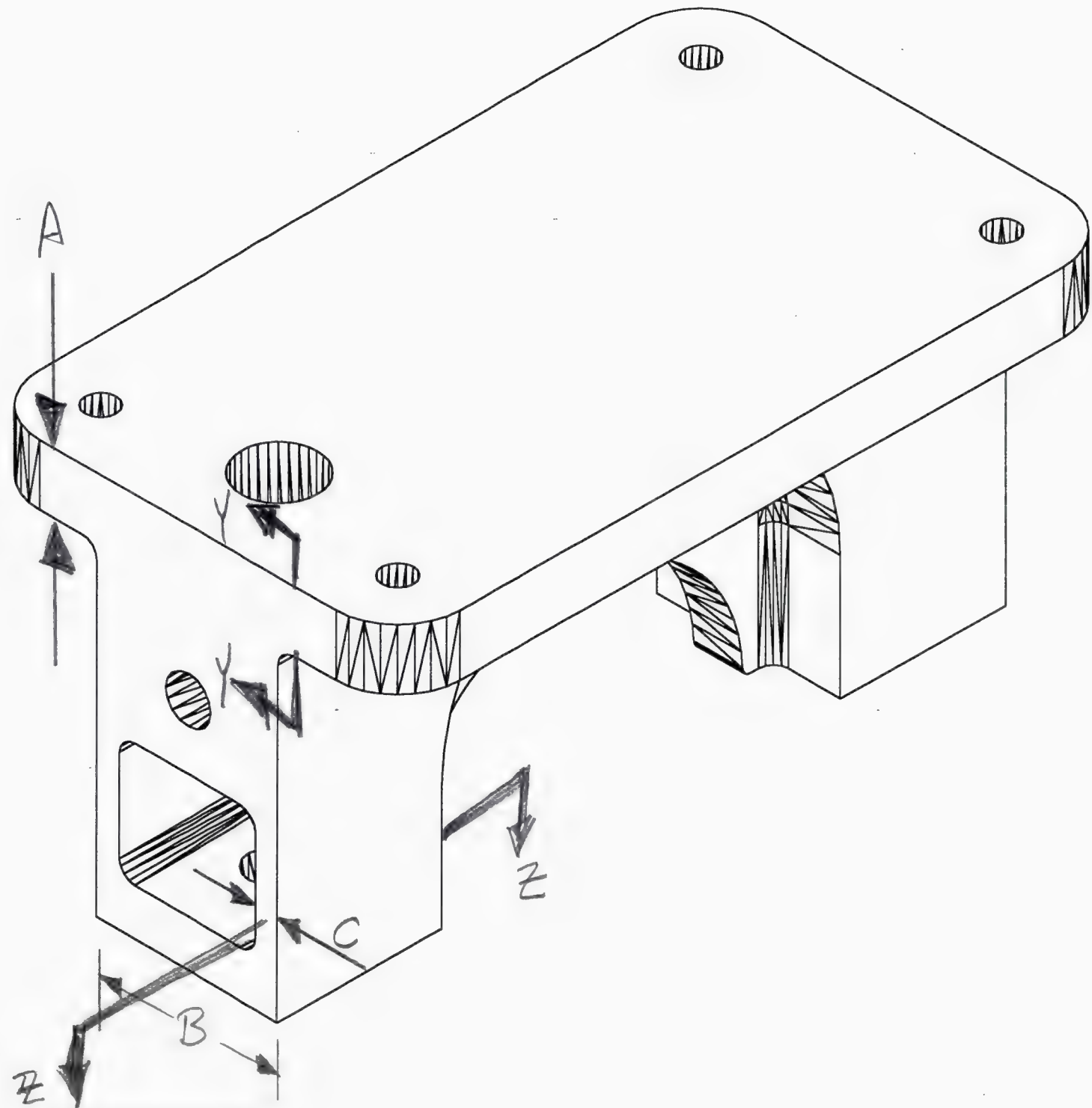
Copy letter for your information.

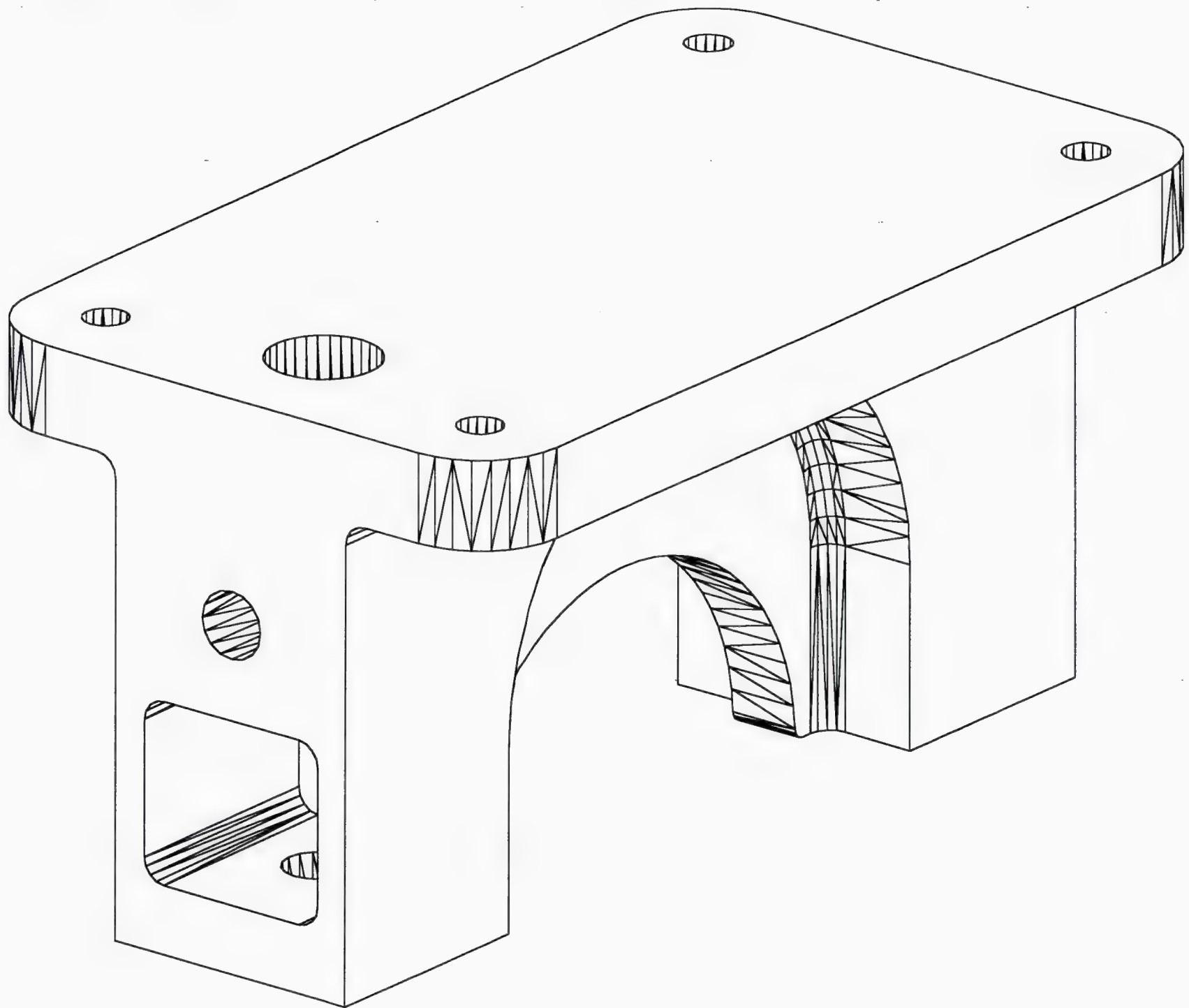
VERIFYING DIMENSIONS
AFT FITTING



THEREFORE $D = 2.625$







Transport
CanadaTransports
Canada

AIRWORTHINESS DIRECTIVES

Applicable to Canadian registered or manufactured aeronautical products

Database Last Updated: 2002-03-16

Directives Pertaining to Model: **BELL, 206L**

40 ADs found

Country: AD Number: AD Subject:

SB

Reference:

CF	<u>CF-2001-33</u>	CHIP DETECTOR ASSEMBLY	206-01-96 REV A
CF	<u>CF-2001-13</u>	SOLOY ENGINE RPM SENSOR	SOLOY 02-680R2
CF	<u>CF-2000-13</u>	COLLECTIVE LEVER - RAISED FORGING BOSS	ASB 206-00-93
CF	<u>CF-98-43</u>	CROSSTUBE ASSEMBLIES	
CF	<u>CF-98-27</u>	TAILBOOM MODIFICATION	ASB 206L-87-47 REV C
CF	<u>CF-98-15</u>	EXTERNAL RESCUE SYSTEMS	CAR 702.21
CF	<u>CF-1998-42R4</u>	CRACKED TAIL BOOM SKIN	206L-99-115 REV E
CF	<u>CF-97-03</u>	MAST AND TRUNNION RETIREMENT LIFE	
CF	<u>CF-96-11</u>	FUEL CELL VENT TUBE - WATER INGESTION	206-95-156
CF	<u>CF-95-19</u>	TEMP-PLATES OVERHEAT INDICATORS	ASB 206L-93-91 REV B
CF	<u>CF-95-17</u>	CROSSTUBE FAILURES	AA-ASB 94045/94046
CF	<u>CF-95-11R2</u>	UNAPPROVED BOLTS, FLIGHT CONTROL SERVO ACTUATORS	206-67-02,206-67A-01
US	<u>95-09-06</u>	INADVERTANT FUEL VALVE SWITCH POSITIONING	206-90-54/206L-90-67
US	<u>94-24-11</u>	TAIL ROTOR DRIVESHAFT MISALIGNMENT	206-92-69/206L-92-84
US	<u>94-20-03</u>	MAIN ROTOR HUB TRUNNION	206L-93-90
US	<u>94-19-02</u>	SWASHPLATE SUPPORT ASSEMBLY	206-93-74 REV B
US	<u>94-15-07</u>	MAIN ROTOR BLADES CRACKS	ASB 206-93-77
US	<u>92-06-12</u>	MAIN TRANSMISSION SUNGEAR	206-90-56,206L-90-69
US	<u>92-01-05</u>	MAIN ROTOR BLADES (FALSIFIED COMPONENT RECORDS)	
US	<u>91-23-15</u>	ENGINE RPM SENSOR	SOLOY 02-680
US	<u>91-03-12</u>	EMERGENCY FLOAT BAGS	206L-89-63,206-89-49
US	<u>90-21-03</u>	TAIL ROTOR BLADE TIP WEIGHT	
US	<u>90-13-01R1</u>	TAIL ROTOR BLADES	
US	<u>89-22-01R1</u>	MAIN ROTOR BLADES	

US	<u>89-20-13</u>	HORIZONTAL STABILIZER	
US	<u>88-26-03</u>	FUEL SYSTEM FLOW SWITCHES	206L-88-52
US	<u>88-23-03</u>	TAIL ROTOR YOKE ASSEMBLY	
US	<u>87-10-11</u>	MAIN ROTOR MAST	206-87-37, -44
US	<u>86-24-01</u>	TAIL ROTOR YOKE	
US	<u>85-26-06</u>	TAIL ROTOR BLADES	
US	<u>85-25-01</u>	CYCLIC CONTROL STICK	206-85-29, 206L-85-36
US	<u>85-09-04</u>	MAIN ROTOR BLADES	ASB 206L-85-35
US	<u>83-03-04</u>	CHECK OF SHEAR HEADS-FLOAT INFLATION VALVES	SB 206L-81-21
US	<u>82-16-12</u>	WITH CHADWICK C-22 AFS PER STC SH139W	CHADWICK SB 20-81-01
US	<u>82-05-03</u>	HORIZONTAL STABILIZER ASSEMBLY	ASB 206L-81-23 REV A
US	<u>80-18-04R1</u>	MAIN ROTOR TRUNNION	ASB 206L-80-9 REV A
US	<u>80-17-05</u>	TAIL ROTOR BLADES	
US	<u>78-24-06R1</u>	HORIZONTAL STABILIZER	
US	<u>78-11-02R1</u>	M/R BLADE STRAPS	
US	<u>76-14-05</u>	FUEL SYSTEM COMPONENTS	

Directives Pertaining to Series: **BELL, 206 SERIES**



Transport
Canada

Transports
Canada

AIRWORTHINESS DIRECTIVES

Applicable to Canadian registered or manufactured aeronautical products

Database Last Updated: 2002-03-16

Directives Pertaining to Model: **BELL, 206L 4**

17 ADs found

Country: AD Number: AD Subject:

SB

Reference:

CF	<u>CF-2002-03R2</u>	K-FLEX DRIVE SHAFT	ASB 407-01-45 REV A
CF	<u>CF-2001-33</u>	CHIP DETECTOR ASSEMBLY	206-01-96 REV A
CF	<u>CF-98-43</u>	CROSSTUBE ASSEMBLIES	
CF	<u>CF-98-34</u>	HYDRAULIC RELIEF VALVE	206L-98-111
CF	<u>CF-98-20</u>	COLLECTIVE IDLER LINK & LEVER RETIREMENT LIVES	206L-98-110
CF	<u>CF-98-15</u>	EXTERNAL RESCUE SYSTEMS	CAR 702.21
CF	<u>CF-98-11</u>	HIGH ALTITUDE TAIL ROTOR KIT	206L-96-104 REV A
CF	<u>CF-1998-42R4</u>	CRACKED TAIL BOOM SKIN	206L-99-115 REV E
CF	<u>CF-97-03</u>	MAST AND TRUNNION RETIREMENT LIFE	
CF	<u>CF-96-11</u>	FUEL CELL VENT TUBE - WATER INGESTION	206-95-156
CF	<u>CF-96-10</u>	FUEL MIGRATION THROUGH DRAIN TUBES	ASB206L-96- 103 REV A
CF	<u>CF-95-17</u>	CROSSTUBE FAILURES	AA-ASB 94045/94046
CF	<u>CF-95-11R2</u>	UNAPPROVED BOLTS, FLIGHT CONTROL SERVO ACTUATORS	206-67-02,206- 67A-01
US	<u>95-09-06</u>	INADVERTANT FUEL VALVE SWITCH POSITIONING	206-90-54/206L- 90-67
US	<u>94-20-03</u>	MAIN ROTOR HUB TRUNNION	206L-93-90
US	<u>94-15-07</u>	MAIN ROTOR BLADES CRACKS	ASB 206-93-77
US	<u>82-16-12</u>	WITH CHADWICK C-22 AFS PER STC SH139W	CHADWICK SB 20-81-01

Directives Pertaining to Series: **BELL, 206 SERIES**

CF-95-17 BELL

Applies to all models of Bell 206 series helicopters equipped with the following crosstube assemblies (crosstubes):

(i) Aeronautical Accessories Inc. P/N 206-320-101 and -102

206-321-001 and -002

206-323-*

206-325-*

206-328-*

206-329-001 and -002

(ii) Airborne Supply Inc. P/N AB206-050-107 and -119*

AB206-053-109*

(iii) Bell Helicopter Textron P/N 206-050-107, -119, -134, -157 and 169*206-053-109, -119 and -129*

(iv) Other manufacturers, as approved by the P/N Any of the above

Federal Aviation Administration (FAA)

under Parts Manufacturer Approval (PMA)

*All dash numbers

Compliance is required as indicated.

Two accidents have been attributed to crosstube failures. There has also been a number of reports of cracks due to corrosion or metal fatigue that might cause a failure of the crosstubes. On the crosstubes of older design, the cracks were mostly found at the rivet holes in the attachment-to-fuselage area and at the saddle attachment. On the newer, clamp-on tubes without holes, the cracks were mostly found in the saddle attachment area and along the line where the clamp touches the tube. Helicopters operating in a corrosive environment, or being used in a training or sightseeing role involving frequent landings are most affected.

To prevent failure of the affected crosstubes accomplish either Part I or Part II below, depending on the type of crosstube:

Part I For Aeronautical Accessories Inc. Crosstubes

A. For Model 206A and 206B Helicopters:

1. Initially, within the next 100 hours time-in-service, unless already accomplished, perform an inspection as per Aeronautical Accessories Inc. Alert Service Bulletin (ASB) No. 94045, Revision B dated 17 April 1995.

2. Not later than 1 February 1996, incorporate into the operator's aircraft inspection program the procedures of Report No. AA-94022, Revision G or later revision, as referenced in ASB No. 94045, Revision B. The required procedures shall be repeated at each annual or 300-hour scheduled inspection, whichever comes first.

B. For Model 206L, 206L-1, -3 and -4 Helicopters:

1. Initially, within the next 100 hours time-in-service, unless already accomplished, perform an inspection as per Aeronautical Accessories Inc. ASB No. 94046, Revision B dated 17 April 1995.
2. Not later than 1 February 1996, incorporate into the operator's aircraft inspection program the procedures of Report No. AA-94023, Revision D or later revision, as referenced in ASB No. 94046, Revision B. The required procedures shall be repeated at each annual or 300-hour scheduled inspection, whichever comes first.

Part II For All Other Affected Crosstubes

1. Initially, within the next 100 hours time in service, perform a detailed visual inspection of the crosstubes for cracks and corrosion, using a 10-power magnifying glass. Pay particular attention in the strap and the saddle attachment area for mechanical damage and corrosion which could lead to cracks. If there is any indication of cracks or corrosion, remove the paint in suspected areas and perform the detailed visual inspection. If the crosstube has rivet holes in the attachment-to-fuselage area, visually check using a 10-power magnifying glass for cracks emanating from the rivets holes. Refer to the applicable Maintenance Manual for inspection limits. In the absence of manufacturer's limits, the maximum allowable depth of corrosion is limited to 0.005 inch over an area not exceeding one-fourth the circumference by 3 inches in length after cleanup, regardless of location. If any crosstube is found corroded beyond the maximum allowable limit, or cracked, replace the part with a serviceable one before further flight.
2. Not later than 1 February 1996, incorporate the requirements of paragraph 1 above in the operator's aircraft inspection program. The required inspection shall be repeated at each annual or 300-hour scheduled inspection, whichever comes first.

Note: The amendments to the aircraft inspection program, required by Parts I and II above, eliminate the requirement to record in the aircraft records the intervals of this directive and the repeat certification of accomplishment in accordance with Airworthiness Manual Chapter 575. This inspection task insertion is to include the following:

"AD CF-95-17 refers. This task is not to be escalated or removed from the inspection program without approval by Transport Canada, Chief Continuing Airworthiness, Ottawa."

Replacement of affected crosstubes with later part number crosstubes constitutes terminating action for the inspection requirements of this directive.

Alternative means of compliance with the requirements of this directive may be used only if approved by the Director, Airworthiness Branch, Transport Canada, Ottawa. Any application should be made to the appropriate regional office.

This airworthiness directive (AD) supersedes Federal Aviation Administration (FAA) AD 95-11-14. It also supersedes Transport Canada Alleviation No. AARDG 95/A90, issued to operators of Canadian registered Bell 206 helicopters on 16 June 1995.

This directive becomes effective 9 January 1996.

CF-98-43 BELL

Applies to all Bell Helicopter Textron Canada (BHTC) Model 206 series helicopters equipped with crosstube assemblies (crosstubes) of older design having rivet holes in the support area designated for rivet-on supports with the following, but not limited to, part numbers:

- (i) Aeronautical Accessories Inc. 206-321-001 and -002
- (ii) Airborne Supply Inc. AB206-050-107-025 and -027
AB206-050-119-005 and -007
- (iii) Bell Helicopter 206-050-107-011, -013, -025 and -027
206-050-119-001, -003, -005 and -007
206-050-134-001, -003, -005, -007, -009 and -011
206-050-157-001 and -003
206-050-169-001, -003, -011 and -013
206-053-109-001, -003, -005 and -007
206-053-119-001 and -003
206-053-129-009, -011, -101 and -103
- (iv) Other manufacturers, as approved by Any of the above
the Federal Aviation Administration (FAA)
under Parts Manufacturer Approval (PMA)

Note: The riveted crosstubes of newer configurations, P/N 206-050-2xx-xxx and 206-053-2xx-xxx, having rivet holes only on the sides of the crosstube, are not affected by this directive.

Compliance is required as indicated, unless already accomplished.

The older versions of riveted crosstubes were subject to fatigue cracking; the large majority of cracks started at the top rivet holes under the support assemblies. A few started elsewhere at corrosion or mechanically damaged initiation points. Two accidents have been attributed to crosstubes breaking from cracks starting at the rivet holes. Since the issue of Airworthiness Directive CF-95-17, which introduced inspections, a total failure of an aft crosstube occurred just 40 hours air time after it was properly inspected. The crack had gone undetected under the strap assembly until progressing rapidly once near the strap's edge. Therefore, these older riveted configurations need to be retired within a reasonable time in service.

To prevent a possible catastrophic failure of the crosstube assemblies accomplish the following:

1. Within the next 100 hours air time after the effective date of this directive, remove from the helicopter any crosstube of unknown history or having a total of six or more years in service.
2. No later than 31 December 2000, remove any of the affected crosstubes, regardless of time in service.

This directive becomes effective 15 February 1999.

MATERIAL COMPARISON

ORIGINAL LANDING GEAR FITTINGS ARE CAST ALUMINUM.

POSSIBLE ALLOYS:

	F_{TU}	F_{SU}	F_{BRU}
A356.0	45 KSI	28 KSI	STRENGTH CLASS 3
354.0	50 KSI	31 KSI	" " 2
C355.0	50 KSI	31 KSI	" " 3
356.0	25	16	INVESTMENT CAST
A357.0	50	31	STR. CLASS 2
D357.0	49	31	DESIGNATED AREA
359.0	47	31	DESIGNATED AREA

FITTINGS COULD BE AS STRONG AS $F_{TU} = 50 \text{ KSI}$
 $F_{SU} = 31 \text{ KSI}$

IN COMPARISON - USING BAR STOCK

6061-T6 QQ-A-225/8 (COLD WORKED) $F_{TU} = 42 \text{ KSI}$
 $F_{SU} = 27 \text{ KSI}$

6061-T6 QQ-A-200/8 (EXTRUDED) $F_{TU} = 38 \text{ KSI}$
 $F_{SU} = 19 \text{ KSI}$

2024-T3 QQ-A-200/3 (EXTRUDED) $F_{TU} = 70 \text{ KSI (L) / 51 (LT)}$
 $F_{SU} = 33 \text{ KSI}$

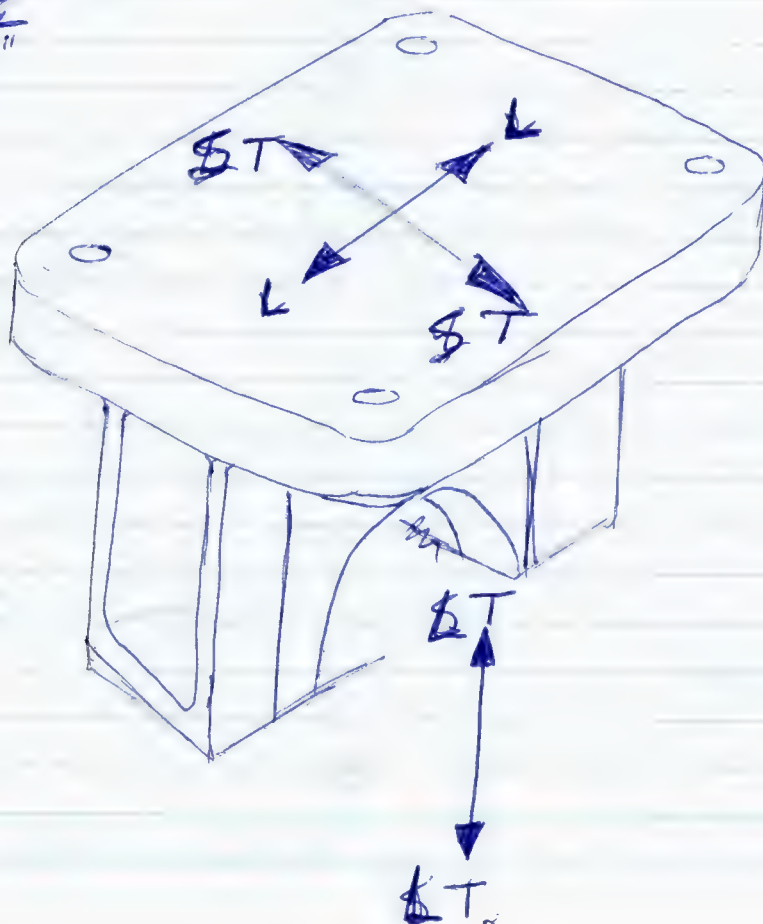
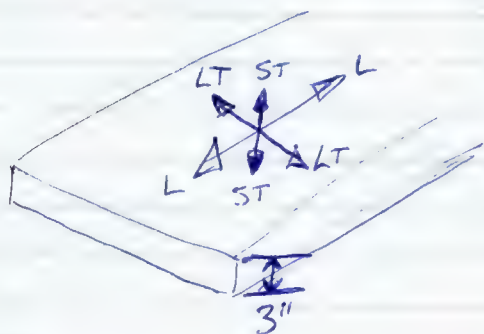
2024-T3 QQ-A-225/6 (COLD WORKED) $F_{TU} = 62 \text{ KSI (L) / 55 (LT)}$
 $F_{SU} = 37 \text{ KSI}$

STRENGTH FACTOR OVER CAST ALUM. 354/C355

	2024-T3 EXTRUDED	2024-T3 COLD WORKED	6061-T6 EXTRUDED COLD WORKED	6061-T6 EXTRUDED
F_{TU}				
L	140%	124%	84%	76%
LT	108%	110% *		
F_{su}	106%	119%	87%	61%

ONLY CHOICE

* THIS ALLOY IS REFERRED TO AS SENSITIVE TO STRESS-CORROSION CRACKING IN THE LT GRAIN DIRECTION.



AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

APPLICANT: AERO Design Ltd.
1045 McTavish Rd. N.E.
Calgary, Alberta, T2E 7G9

DATE: 12 March, 2002
REV. No. 0

CORRESPONDANCE TO:
(If other than applicant)

MAKE: Bell Helicopter
MODEL: 206B, 206L, 206L-1, 206L-3, 206L-4

REGISTRATION: All Applicable
SERIAL No.: All Applicable

NATURE OF WORK: Installation of External Attachment Provisions

MODEL CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.

MODIFICATION CERTIFICATION BASIS: FAR 27, Amendment 27-24, with exceptions as noted below.

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
Paragraph	Amdt.				
Subpart B – Flight					
27.29	24 Empty Weight and Corresponding C of G	Data specified on inst'n drawing		X	
Subpart C – Strength Requirements					
27.301	24 Loads	Compliance with 23.471, 23.473, 23.337 and 23.561		X	
27.303	24 Factor of Safety	Analysis		X	
27.307	28 Proof of Structure	Analysis		X	
27.337	28 Limit Maneuvering Load Factor	Analysis		X	Limit maneuvering load factor to be applied in analysis to demonstrate vertical capacity of external attachment
27.471	24 Ground Loads – General	Analysis to demonstrate equivalent strenght of existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.473	24 Ground loading conditions and assumptions	Analysis to demonstrate equivalent strenght of existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.

AIRWORTHINESS REQUIREMENTS COMPLIANCE PROGRAM

Airworthiness Requirement	Subject for Compliance or Documentary Proof	Form of Substantiation	DOT	DAR	Comments
27.501	28 Ground Loading Conditions – Landing Gear with Skids	Equivalent strenght of existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.561	24 Emergency Landing Conditions	Analysis		X	Limit maneuvering load factor to be applied in analysis to demonstrate vertical capacity of external attachment <i>Paul Dwyer</i>
Subpart D – Design and Construction					
27.601	24 Design	Drawings		X	Design is conventional.
27.603	24 Materials	Drawings		X	Materials used are specified in Mil-Hdbk-5H.
27.605	24 Fabrication Methods	Drawings		X	Design is conventional.
27.609	24 Protection of Structure	Drawings		X	
27.611	24 Inspection Provisions	Drawings		X	Design is easy to inspect.
27.613	28 Material Strength Properties and Design Values	Values used as per Mil-Hdbk-5H		X	
27.625	24 Fitting Factor	Analysis		X	
27.725	24 Limit Drop Test	Analysis to demonstrate equivalent strenght of existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.
27.727	28 Reserve Energy Absorbtion Drop Test	Analysis to demonstrate equivalent strenght of existing fitting	X		Landing gear loads on fitting to be assessed by comparison with ultimate strength of original Type Approved fitting.

HELICOPTER DROP TEST APPROXIMATION

Lift from rotor not considered. Geometry of crosstubes simplified for analysis ~~(I think it cancels out)~~

	Gross Weight of Helicopter.	$W := 4450 \cdot \text{lbf}$
	Acceleration due to gravity.	$g = 32.17 \cdot \frac{\text{ft}}{\text{sec}^2}$
	Drop Test height. (FAR 27.725)	$h := 13 \cdot \text{in}$
$V_{\text{drop}} := \sqrt{2 \cdot g \cdot h}$	Landing Speed in drop test.	$V_{\text{drop}} = 8.35 \cdot \frac{\text{ft}}{\text{sec}} \approx 500 \text{ FPM}$
$PE := W \cdot h$	Potential Energy prior to drop.	$PE = 4821 \cdot \text{lbf} \cdot \text{ft}$
$KE := \left(\frac{1}{2}\right) \cdot \left(\frac{W}{g}\right) \cdot V_{\text{drop}}^2$	Kinetic Energy at Landing (check).	$KE = 4821 \cdot \text{lbf} \cdot \text{ft}$
$SE := KE$	Kinetic Energy of helicopter must be transformed into strain energy in the crosstubes to absorb impact.	$SE = 4821 \cdot \text{lbf} \cdot \text{ft}$
	Maximum forward cg at max. weight.	$cg_{\text{fwd}} := 119.4 \cdot \text{in}$
	Maximum aft cg at max. weight.	$cg_{\text{aft}} := 126.4 \cdot \text{in}$
	Maximum left cg at max. weight.	$cg_{\text{left}} := 1.20 \cdot \text{in}$
	Maximum right cg at max. weight.	$cg_{\text{right}} := 1.61 \cdot \text{in}$
	Position of front landing gear crosstube.	$x_{\text{fwd}} := 73.0 \cdot \text{in}$
	Position of aft landing gear crosstube.	$x_{\text{aft}} := 155.2 \cdot \text{in}$
	Spacing of landing gear skid tubes.	$y_{\text{gear}} := 86 \cdot \text{in}$
$r_{cg_f} := \frac{cg_{\text{fwd}} - x_{\text{fwd}}}{x_{\text{aft}} - x_{\text{fwd}}}$	Proportion of max. weight on aft gear with max forward cg.	$r_{cg_f} = 56.4 \cdot \%$
$r_{cg_a} := \frac{cg_{\text{aft}} - x_{\text{fwd}}}{x_{\text{aft}} - x_{\text{fwd}}}$	Proportion of max. weight on aft gear with max aft cg.	$r_{cg_a} = 65.0 \cdot \%$
$r_{cg_l} := \frac{1}{2} - \frac{cg_{\text{left}}}{y_{\text{gear}}}$	Proportion of max. weight on right gear with max left cg.	$r_{cg_l} = 48.6 \cdot \%$
$r_{cg_r} := \frac{1}{2} + \frac{cg_{\text{right}}}{y_{\text{gear}}}$	Proportion of max. weight on right gear with max right cg.	$r_{cg_r} = 51.9 \cdot \%$

Forward Cross Tube:

Outside Diameter.

$$OD_f := 2.25 \cdot \text{in}$$

Wall Thickness of tube.

$$t_f := 0.188 \cdot \text{in}$$

$$ID_f := OD_f - 2 \cdot t_f$$

Inside Diameter.

$$ID_f = 1.87 \cdot \text{in}$$

$$I_{fwd} := \frac{\pi}{64} \cdot (OD_f^4 - ID_f^4)$$

Moment of Inertia.

$$I_{fwd} = 0.653 \cdot \text{in}^4$$

Horizontal Length of crosstube leg
from skid to fuselage attachment.

$$L_{fwd} := 29.7 \cdot \text{in}$$

Aft Cross Tube:

Outside Diameter.

$$OD_a := 2.50 \cdot \text{in}$$

Wall Thickness of tube.

$$t_a := 0.250 \cdot \text{in}$$

$$ID_a := OD_a - 2 \cdot t_a$$

Inside Diameter.

$$ID_a = 2.00 \cdot \text{in}$$

$$I_{aft} := \frac{\pi}{64} \cdot (OD_a^4 - ID_a^4)$$

Moment of Inertia.

$$I_{aft} = 1.13 \cdot \text{in}^4$$

Horizontal Length of crosstube leg
from skid to fuselage attachment.

$$L_{aft} := 32.75 \cdot \text{in}$$

Properties of Cross Tube Material (7075-T6 Drawn Tube)Modulus of Elasticity of 7075-T6
Aluminum Tubing.

$$E := 10.3 \cdot 10^6 \cdot \text{psi}$$

Ultimate Tensile Strength of 7075-T6
Aluminum Tubing WW-T-700/7

$$F_{tu_7075T6} := 77 \cdot \text{ksi}$$

Limit Tensile Strength of 7075-T6
Aluminum Tubing WW-T-700/7

$$F_{ty_7075T6} := 66 \cdot \text{ksi}$$

D/t ratio for front crosstube.

$$\frac{OD_f}{t_f} = 11.97$$

Modulus of Rupture for aluminum
alloy round tubing
(Ref Mil-Hdbk-5H, Figure 3.11.1.1.1)

$$k_f := 1.36$$

D/t ratio for aft crosstube.

$$\frac{OD_a}{t_a} = 10.00$$

Modulus of Rupture for aluminum
alloy round tubing
(Ref Mil-Hdbk-5H, Figure 3.11.1.1.1)

$$k_a := 1.4$$

$$SE = 4821 \cdot \text{lb} \cdot \text{ft}$$

Total Strain Energy that must be developed to absorb energy of drop.

$$U := \frac{1}{2} \int_0^L \frac{M(x)^2}{E \cdot I} dx$$

Bruhn, Page A.7.2, equation (5), Strain Energy of Flexure.
Kinetic Energy is absorbed by bending the crosstube.

$$SE = 2 \cdot \frac{(P_{aft} \cdot L_{aft})^2 \cdot L_{aft}}{6 \cdot E \cdot I_{aft}} + 2 \cdot \frac{(P_{fwd} \cdot L_{fwd})^2 \cdot L_{fwd}}{6 \cdot E \cdot I_{fwd}}$$

Solving Integral using geometry shown in Figure XX.XX.

Where: $P_{fwd} = (1 - r_{w_f}) \cdot R$ and: $P_{aft} = r_{w_f} \cdot R$

Reaction Loads on front and back cross tubes.

Then: $R := \sqrt{\frac{3 \cdot E \cdot SE}{\frac{r_{cg_f}^2 \cdot L_{aft}^3}{I_{aft}} + \frac{(1 - r_{cg_f})^2 \cdot L_{fwd}^3}{I_{fwd}}}}$

Total vertical reaction force on landing gear to arrest drop velocity.

$$R = 10107 \cdot \text{lb} \cdot \text{f}$$

$$n_{drop} := \frac{R}{W}$$

Acceleration due to Reaction Force.

$$n_{drop} = 2.27$$

$$P_f := (1 - r_{cg_f}) \cdot R \cdot r_{cg_r}$$

Proportion of Reaction Load applied to single forward crosstube leg. CG is max. forward and max. right for worst case.

$$P_f = 2283 \cdot \text{lb} \cdot \text{f}$$

$$\delta_{fwd} := \frac{P_f \cdot L_{fwd}^3}{I_{fwd} \cdot E}$$

Deflection of front crosstube legs.

$$\delta_{fwd} = 8.9 \cdot \text{in}$$

$$f_{b_fwd} := \frac{P_f \cdot L_{fwd} \cdot \frac{OD_f}{2}}{I_{fwd}}$$

Bending Stress Applied to front crosstube legs.

$$f_{b_fwd} = 117 \cdot \text{ksi}$$

$$F_{by} := F_{ty_7075T6} \cdot k_f$$

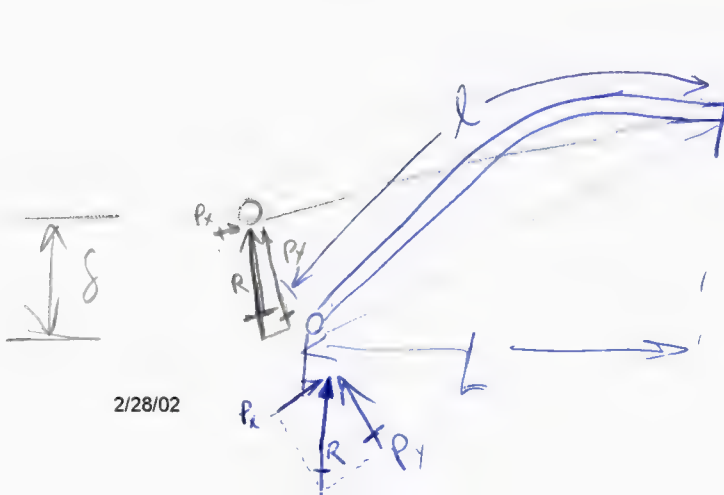
Bending Modulus of Rupture for 7075-T6 Drawn Tube.

$$F_{by} = 90 \cdot \text{ksi}$$

$$YMS := \frac{F_{by}}{f_{b_fwd}} - 1$$

Margin of Safety.

$$YMS = -0.23$$



2/28/02

- STRAIN ENERGY ABSORBED ALONG WHOLE LENGTH OF LEG, BUT BENDING MOMENT ONLY COMES FROM LOAD X ARM THAT ARE PERPENDICULAR.
- BT USING ONLY THE VERTICAL REACTION LOAD DIRECTION, AND LIMITING THE LENGTH OF THE LEG, SOME ENERGY ABSORPTION ABILITY HAS BEEN IGNORED. THE LEG CAN ABSORB MORE ENERGY THAN ACTUALLY SHOWN.
- BT INCREASING "L", "R" GOES DOWN, IN EQUATION ②

$$P_a := r_{cg_a} \cdot R \cdot r_{cg_r}$$

Proportion of Reaction Load applied to single aft crosstube leg. CG is max. aft and max. right for worst case.

$$P_a = 3406 \cdot \text{lbf}$$

$$\delta_{aft} := \frac{P_a \cdot L_{aft}^3}{I_{aft} \cdot E}$$

Deflection of aft crosstube legs.

$$\delta_{aft} = 10.3 \cdot \text{in}$$

$$f_{b_aft} := \frac{P_a \cdot L_{aft} \cdot \frac{OD_a}{2}}{I_{aft}}$$

Bending Stress Applied to aft crosstube legs.

$$f_{b_aft} = 123 \cdot \text{ksi}$$

$$F_{by} := F_{ty_7075T6} \cdot k_a$$

Bending Modulus of Rupture for 7075-T6 Drawn Tube.

$$F_{by} = 92 \cdot \text{ksi}$$

$$YMS := \frac{F_{by}}{f_{b_aft}} - 1$$

Margin of Safety.

$$YMS = -0.25$$

3.2 Mechanical properties.

3.2.1 Tensile strength, yield strength and elongation properties. The tensile strength, yield strength and elongation mechanical properties parallel to the direction of drawing shall conform to the requirements specified in table II.

TABLE II. Tensile strength, yield strength and elongation properties

Temper	Wall thickness, Inch	Tensile strength, minimum, ksi	Yield strength		Percent elongation in 2 inches or 40 $\frac{1}{2}$, minimum, kind of specimen	
			At 0.2 per- cent, offset, minimum, ksi	At extens- ion under load, inch per inch	Full section	Cut-out
O	0.025 to 0.049, incl.	40.0 ^{2/}	21.0 ^{2/ 3/}	0.0040	10	8
	0.050 to 0.500, incl.	40.0 ^{2/}	21.0 ^{2/ 3/}	0.0040	12	10
T6 and T62 ^{4/}	0.025 to 0.259, incl.	77.0	66.0	0.0084	8	7
	0.260 to 0.500, incl.	77.0	66.0	0.0084	9	8
T73	0.025 to 0.259, incl.	66.0	56.0	-	10	8
	0.260 to 0.500, incl.	66.0	56.0	-	12	10
F	0.025 to 0.500, incl.	5/	5/	5/	5/	5/

1/ Round tube 2 inches or less in outside diameter and square tube 1-1/2 inches or less

on a side shall be tested in full section unless the limitations of the testing machine preclude the use of such a specimen. For round tube over 2 inches in diameter, for square tube over 1-1/2 inches on a side, for all sizes of the tube other than round or square, or in those cases when a full section specimen cannot be used

a cut-out specimen shall be used. O represents the diameter of the cut-out.

2/ Maximum

3/ Applies only to round tube (type I)

4/ Tube in the T62 temper is not available from the materials producers

5/ No requirements

3.2.2 Flattening. When specified (see 6.2), round tube (type I) in O and T6 tempers shall withstand, without cracking, the flattening test or the alternative bend test specified in WW-T-700/GEN. The values for flattening factor "F" are specified in table III.

3.11 ELEMENT PROPERTIES

3.11.1 BEAMS — See Chapter 1 and Reference 1.7.1 for general information on stress analysis of beams.

3.11.1.1 Simple Beams — Beams of solid, tubular, or similar cross sections can be assumed to fail through exceeding an allowable modulus of rupture in bending (F_b). In the absence of specific data, the ratio F_b/F_{tu} can be assumed to be 1.25 for solid sections.

3.11.1.1.1 Round Tubes — For round tubes, the value of F_b will depend on the D/t ratio as well as the ultimate tensile stress. The bending moduli of rupture of round tubes of various aluminum alloys are given in Figure 3.11.1.1.1. It should be noted that these values apply only when the tubes are restrained against local buckling at the loading points.

3.11.1.1.2 Unconventional Cross Section — Sections other than solid or tubular should be tested to determine the allowable bending stress.

3.11.1.2 Built-Up Beams — Built-up beams will usually fail because of local failures of the component parts. In aluminum-alloy construction, the strength of fittings and joints is an important feature (see Reference 3.11.1.2).

3.11.1.3 Thin-Web Beams — The allowable stress for thin-web beams will depend on the nature of the failure and is determined from the allowable stresses of the web in tension and of the flanges or stiffeners in compression.

3.11.2 COLUMNS

3.11.2.1 Primary Failure — The general formula for primary instability is given in Section 1.3.8.

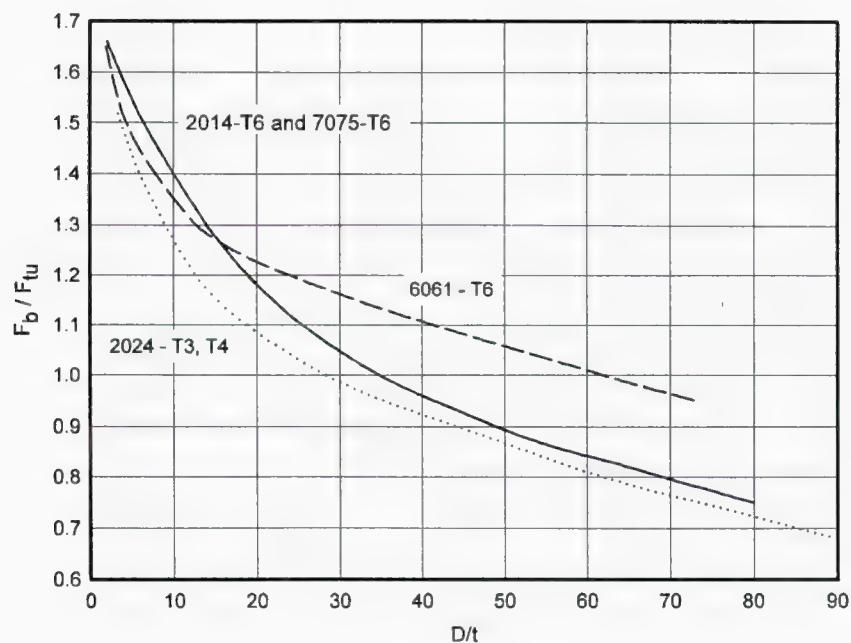
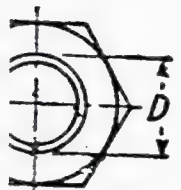


Figure 3.11.1.1.1. Bending modulus of rupture for aluminum alloy round tubing.

6 1/4
9/32

All screw threads in Standard. (See series. See also page of the nut.



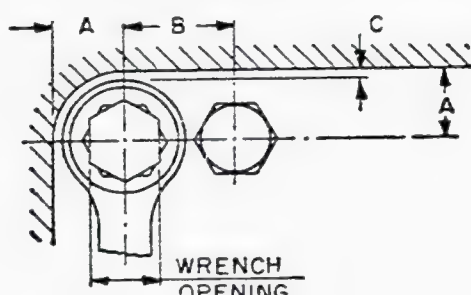
Height P	Diameter A
19/64	Hex. Size Minus 1/32 in.
5/16	
25/64	
27/64	
15/32	
17/32	
5/8	
23/32	
13/16	
15/16	
63/64	Hex. Size Minus 1/16 in.
3/16	
3/8	
9/16	
5/8	
15/16	
1 1/8	
1 1/4	

s. Height H' for
minus H'.
ger sizes.

All dimensions given in inches.
 * Wrenches shall be marked with the "Nominal Size of Wrench" which is equal to the basic or maximum width across flats of the corresponding bolt head or nut.
 Minimum wrench opening equals $(1.005W + 0.001)$. Tolerance on wrench opening equals plus $(0.005W + 0.004)$ from minimum, where W equals nominal size of wrench.

Wrench Clearance Dimensions. — Wrench clearances are given in Tables 1 and 2. They are based on a wrench opening corresponding to the dimension across the flats of the fastener. The listed values were obtained from a composite study of the alloy steel wrenches that are commercially available and military specifications. They are suitable for general use as minimum requirements.

Table 1. Wrench Clearances for Box Wrench — 12 Point
 (From SAE Aeronautical Drafting Manual)



E = TORQUE THAT
WRENCH WILL
WITHSTAND IN
INCH-POUNDS

ALL DIMENSIONS IN
INCHES EXCEPT WHERE
OTHERWISE NOTED

Wrench Opening	A Min.	B Min.	C Ref.	D Max.	E Min.	Wrench Opening	A Min.	B Min.	C Ref.	D Max.	E Min.
.156	.190	.280	.030	.156	100	.781	.690	1.140	.030	.594	2600
.188	.200	.309	.030	.172	150	.812	.720	1.190	.030	.594	3000
.250	.270	.410	.030	.250	150	.875	.750	1.260	.030	.594	3300
.312	.300	.480	.030	.281	210	.938	.780	1.320	.030	.656	4100
.344	.300	.500	.030	.281	250	1.000	.810	1.390	.030	.718	4900
.375	.340	.560	.030	.344	370	1.062	.840	1.450	.030	.781	5400
.438	.400	.650	.030	.359	650	1.125	.950	1.600	.030	.844	5900
.500	.450	.740	.030	.375	1020	1.250	.980	1.700	.030	.875	7200
.562	.500	.830	.030	.406	1200	1.312	1.090	1.850	.030	.906	8000
.594	.530	.870	.030	.469	1200	1.438	1.220	2.050	.030	1.000	8400
.625	.560	.920	.030	.469	2000	1.500	1.270	2.140	.030	1.062	10450
.688	.590	.990	.030	.531	2300	1.625	1.340	2.280	.030	1.156	11750
.750	.660	1.090	.030	.594	2600	.....	.....	.....	.....	.....	.....

Table 2. Wrench Clearances for Open End Engineers Wrench 15° and Socket Wrench (Regular Length)
(From SAE Aeronautical Drafting Manual)

<p>H=THICKNESS OF WRENCH HEAD</p> <p>J=TORQUE THAT WRENCH WILL WITHSTAND IN INCH-POUNDS</p> <p>OPEN END ENGINEERS WRENCH 15°</p>										<p>Q SQUARE DRIVE</p> <p>SOCKET (REGULAR LENGTH)</p>										<p>P=TORQUE THAT WRENCH WILL WITHSTAND IN INCH-POUNDS</p> <p>* DOES NOT INCLUDE ALLOWANCE FOR TORQUE DEVICE</p> <p>WRENCH OPENING</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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.156	.220	.250	.390	.160	.250	.200	.030	.094	25</

American



Nom- inal Size	Body Dia-	
	Max.	Min.
1/4	0.250	0.
5/16	0.3125	0.
3/8	0.375	0.
7/16	0.4375	0.
1/2	0.500	0.
9/16	0.5625	0.
5/8	0.625	0.
3/4	0.750	0.

Threads are Coarse-
l = 2 D + 1/4 inch.

American Stan-

Size, D	Threads per Inch†	
	No. 10	24
1/4	20	20
5/16	18	18
3/8	16	16
7/16	14	14
1/2	13	13
5/8	11	11
3/4	10	10
7/8	9	9
1	8	8

All dimensions are in inches.
* Full-size body bolt case the body diameter.
† Threads are Coarse- for bolts up to 6 inches shorter than 2D plus 1/4.

AERO DESIGN LTD.
1045 McTavish Rd. N. E.
Calgary, Alberta, T2E 7G9

F A X C O V E R S H E E T

DATE: 21 FEB 92

TIME: 1:10

TO: INTERFAST

PHONE:

0770

FAX:

(416) 674-5804

FROM: S. Fahey
Aero Design Ltd.

PHONE: 403-250-8027

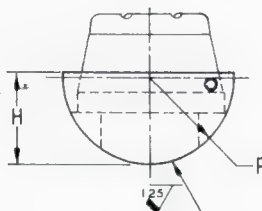
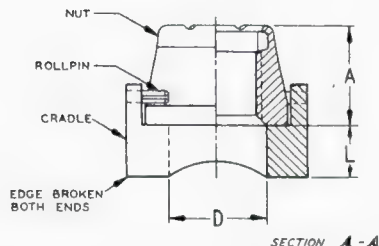
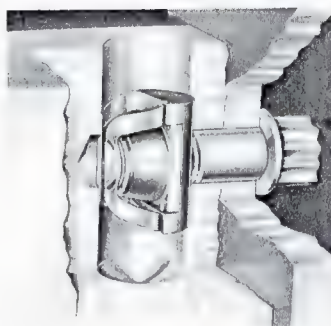
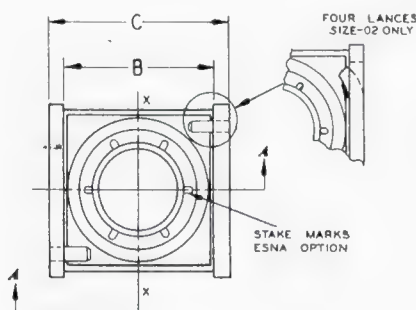
FAX: 403-250-8333

Number of pages including cover sheet: 2

RE: BARREL NUT SUPPLIERS

CAN YOU FIND A SUPPLIER FOR
BARREL NUTS SUCH AS THESE?
ESNA HAS BEEN BOUGHT AND HAS
LEFT NO TRACE.

STEVE



ESNA NUT PART NUMBER	THREAD	A ±.015	B REF	C ±.015	D ±.005	H ±.010	L ±.010	R +.0000 -.0015	ULTIMATE TENSILE STRENGTH LB MIN	APPROX WEIGHT LB/100	ESNA RETAINER PART NUMBER
2552-02	.1900-32 UNJF-3B	.235	.316	.375	.227	.255	.099	.2010	4,070	.41	2552-02RET
2552-04B	.2500-28 UNJF-3B	.296	.505	.625	.287	.355	.192	.2790	7,260	1.2	2577-04BRET
2552-054	.3125-24 UNJF-3B	.353	.536	.666	.350	.359	.180	.3105	11,500	1.5	2577-054RET
2552-064	.3750-24 UNJF-3B	.447	.630	.815	.412	.397	.205	.3730	17,100	2.5	2552-064RET
2552-070	.4375-20 UNJF-3B	.491	.755	.978	.475	.454	.247	.4355	23,175	4.5	2552-070RET
2552-080	.5000-20 UNJF-3B	.544	.818	1.097	.537	.493	.269	.4670	30,825	5.5	2552-080RET
2552-098	.5625-18 UNJF-3B	.605	.927	1.227	.600	.548	.313	.5215	39,150	8.3	2552-098RET
2552-108	.6250-18 UNJF-3B	.684	1.052	1.380	.662	.597	.345	.5915	49,050	12.0	2552-108RET
2552-126	.7500-16 UNJF-3B	.782	1.224	1.793	.787	.685	.405	.6855	71,100	20.0	2552-126RET
2552-144	.8750-14 UNJF-3B	.858	1.447	2.000	.912	.827	.516	.7792	96,860	30.0	2552-144RET
2552-164	1.0000-14 UNJS-3B	.968	1.697	2.390	1.037	.985	.648	.9355	128,250	49.0	2552-162RET
2552-182	1.1250-12 UNJF-3B	1.129	1.947	2.750	1.162	1.061	.696	1.0605	162,000	74.0	2552-182RET
2552-202	1.2500-12 UNJF-3B	1.316	2.103	2.968	1.287	1.132	.740	1.1855	202,500	100.0	2552-202RET

MATERIAL:

NUT - STEEL, AISI 4130 OR EQUIV.
CRADLE - ALUMINUM ALLOY, 7075-T6.
ROLLPINS - CARBON STEEL.

FINISH:

NUT & ROLLPINS - CADMIUM PLATE, QQ-P-416, TYPE I, CLASS 2 (SEE CODE)
CRADLE - ALODINE, MIL-C-5541 (SIZE -02 ONLY)
CRADLE - ANODIZED, MIL-A-8625. (ALL OTHER SIZES)

PART CODING:

F 2552-04B

THREAD SIZE
NUT TYPE
FOR POST PLATE TREATMENT (PER QQ-P-416, TYPE II) ON
CADMIUM PLATED PARTS, PREFIX COMPLETE PART NUMBER
WITH LETTER "F".

FLOAT: THE NUT WILL FLOAT A MINIMUM TOTAL OF .030 ON THE X-X AXIS OF THE CRADLE WHEN INSTALLED IN A HOLE .004 LARGER THAN THE MAXIMUM CRADLE DIAMETER.

LOCKING INSERT: RED NYLON. (250°F MAX PERFORMANCE)

HARDNESS: NUT ONLY, ROCKWELL "C" 29-35 (SIZES -04B AND LARGER)
ROCKWELL "C" 31-37 (SIZE -02)

MAGNETIC PARTICLE INSPECTION: NUT INDIVIDUALLY INSPECTED IN ACCORDANCE WITH MILITARY SPECIFICATION MIL-I-6868.

THREADS: MIL-5-8879

SURFACE FINISH: MIL-STD-10.

PERFORMANCE: TORQUE - MIL-N-25027

YIELD STRENGTH - AT 2/3 OF THE ULTIMATE TENSILE STRENGTH OF THE NUT THERE WILL BE NO PERMANENT DISTORTION OR YIELDING OF THE NUT WHICH WILL AFFECT FUNCTIONING, USE, OR REUSE OF THE NUT.

AXIAL TENSILE STRENGTH - EQUIVALENT TO 180,000 PSI AT THE BASIC PITCH DIAMETER AND WILL BE OBTAINED WHEN TENSILE TESTED WITH A BOLT HAVING A MINIMUM TENSILE STRENGTH OF 200,000 PSI AND INSTALLED IN A 7075-T6 ALUMINUM ALLOY FITTING HAVING AN INSTALLATION HOLE DIAMETER APPROXIMATELY .004 LARGER THAN THE CORRESPONDING BARREL NUT DIAMETER MAXIMUM.

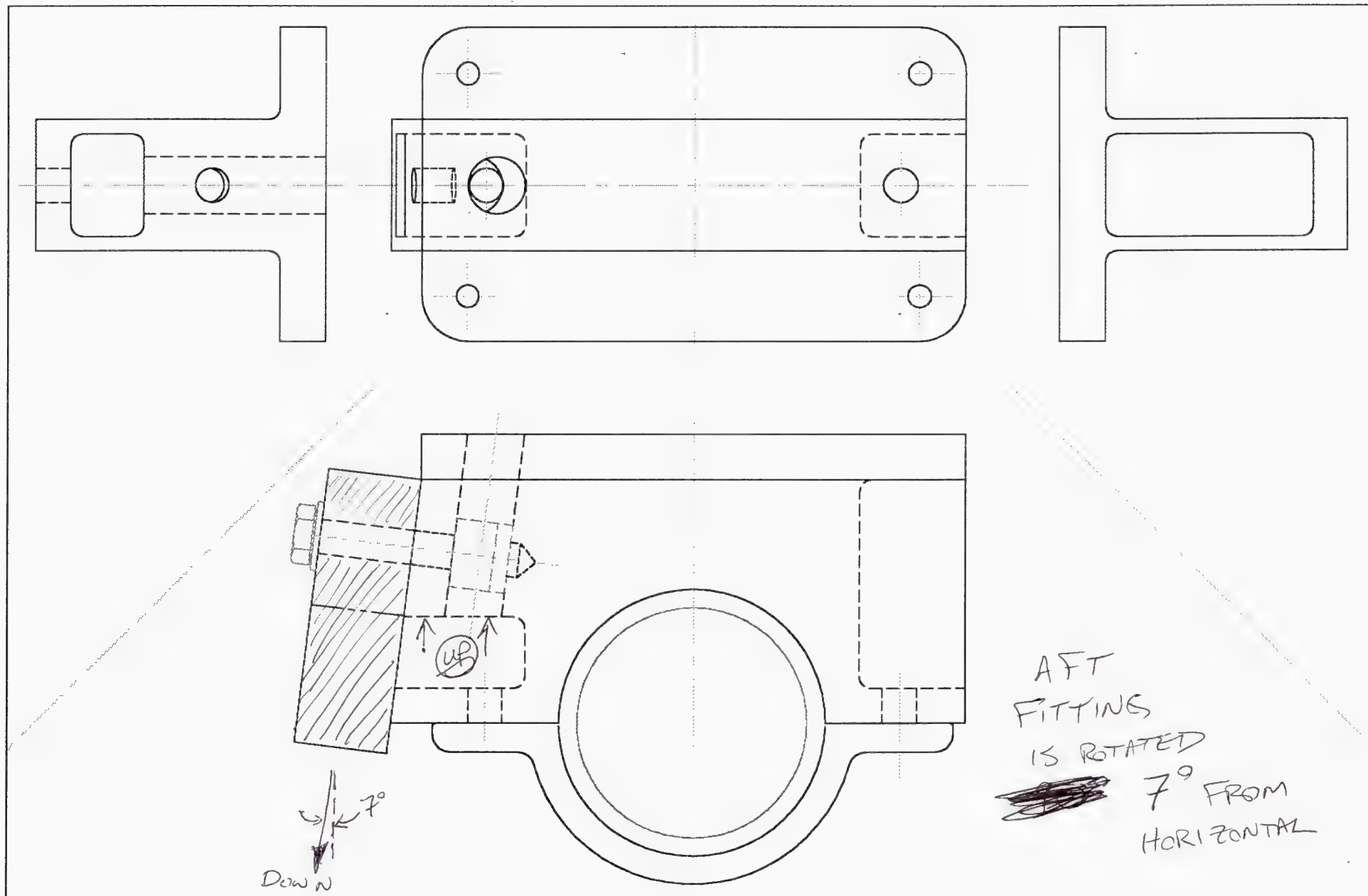
THESE ULTIMATE STRENGTH VALUES ARE EQUAL TO, OR IN EXCESS OF, THE TENSILE STRENGTH OF NAS624-644 SERIES BOLTS.

PJ-2239

REFERENCE STANDARDS:

**NUT-BARREL, HIGH TENSILE,
FLOATING & RETAINER, 250°F**

**2552
2552RET**
PAGE 1 OF 2



FRONT HIGH SKID GEAR
X-TUBE 2.25

BEARING OF FITTING 0.404" WIDE

BEARING PLATE WRAPPED AROUND TUBE $2.31 - 2.25 = 0.06$

BEARING EAR TO EAR 26.25"
EARS ON INSIDE

BACK

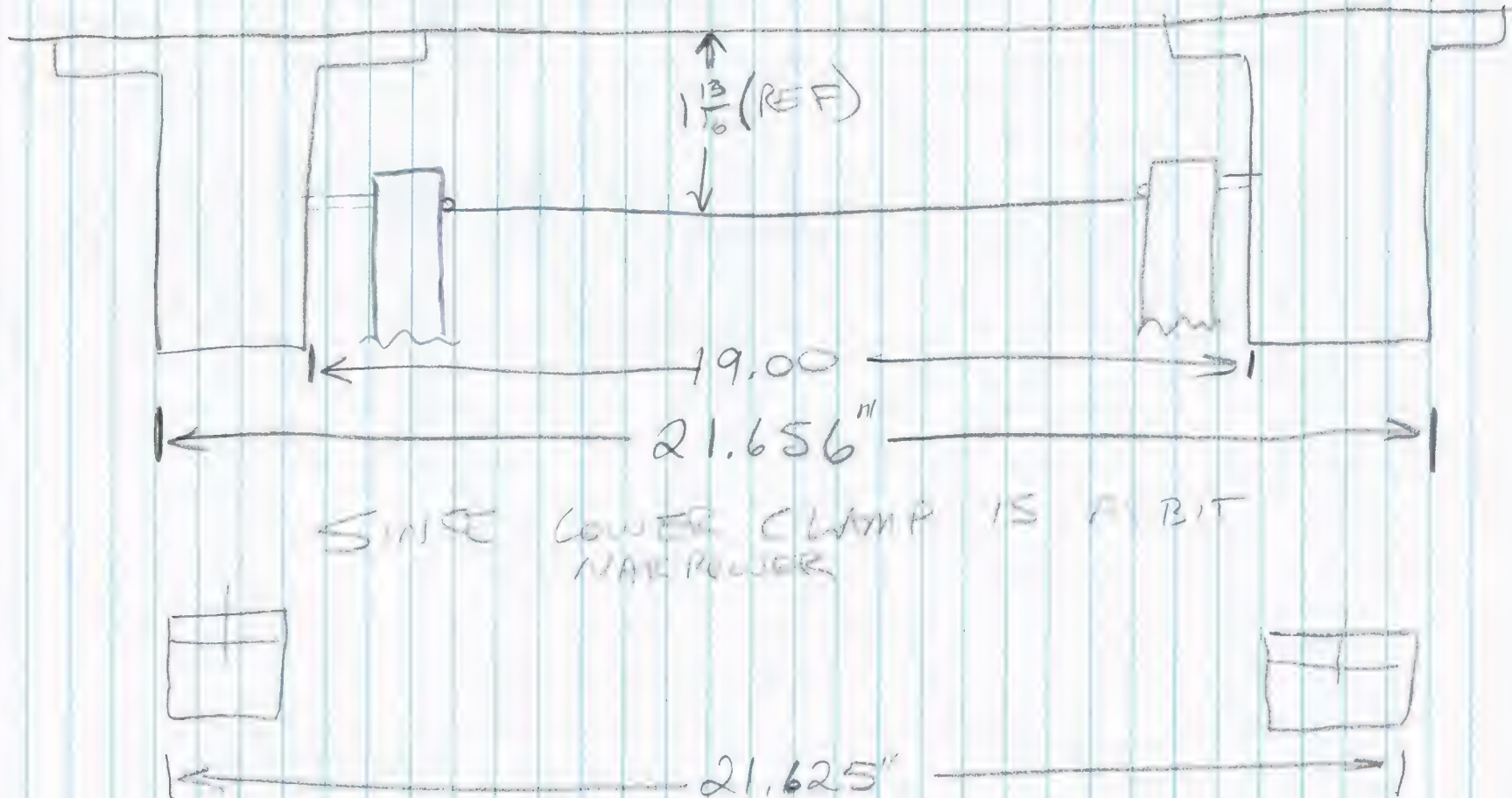
X-TUBE 2.498"

BEARING FITTING ? 0.313" WIDE

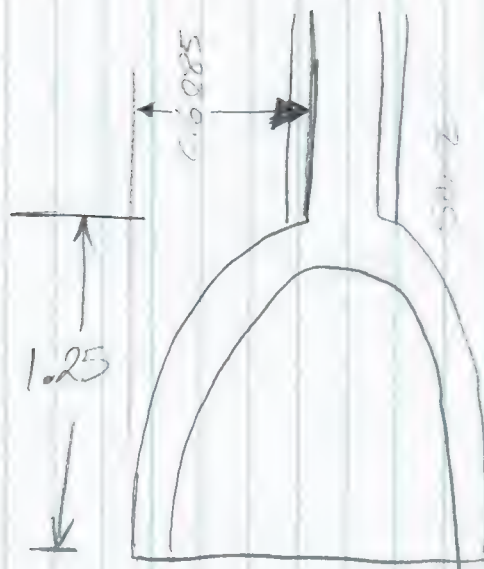
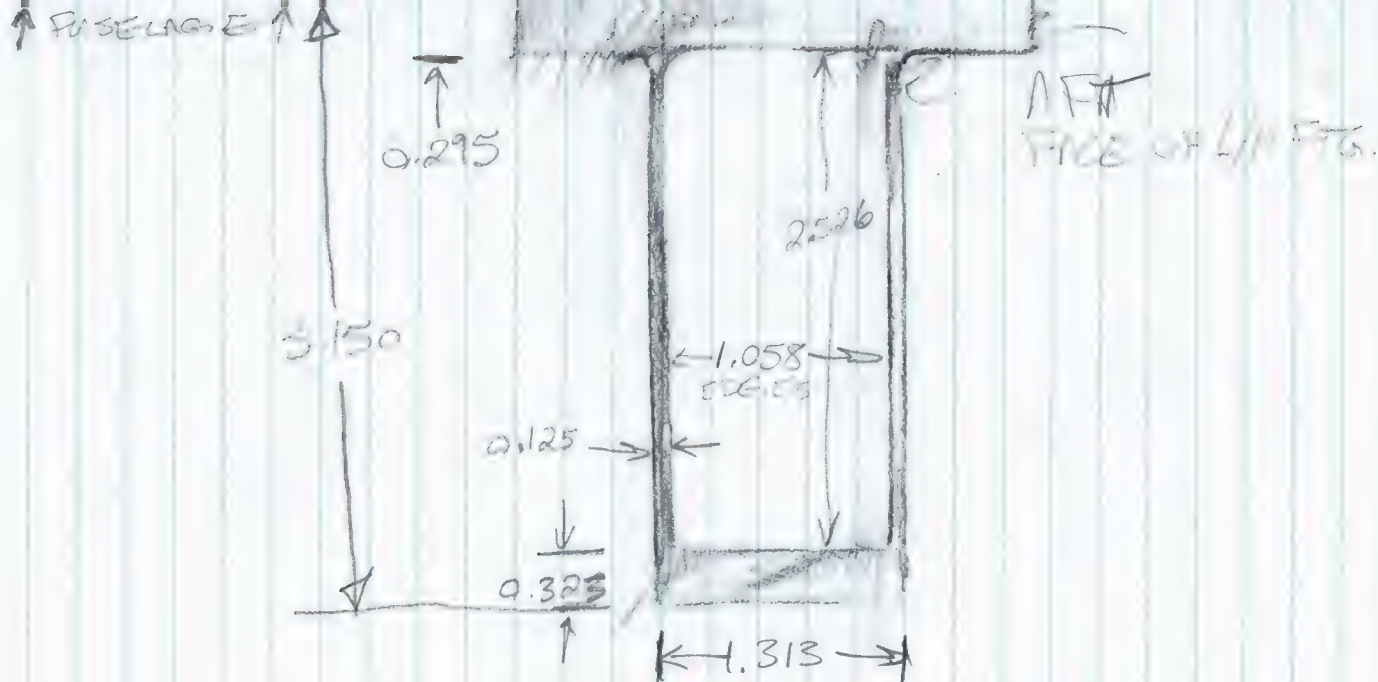
PLATE + TUBE 2.57"

BEARINGS EAR TO EAR 20.25"

AST 206L



P/W 206-033-109-001 AF 44



MEASURE 1.9040
 RULER 1.2955
 0.6085

FT FTG

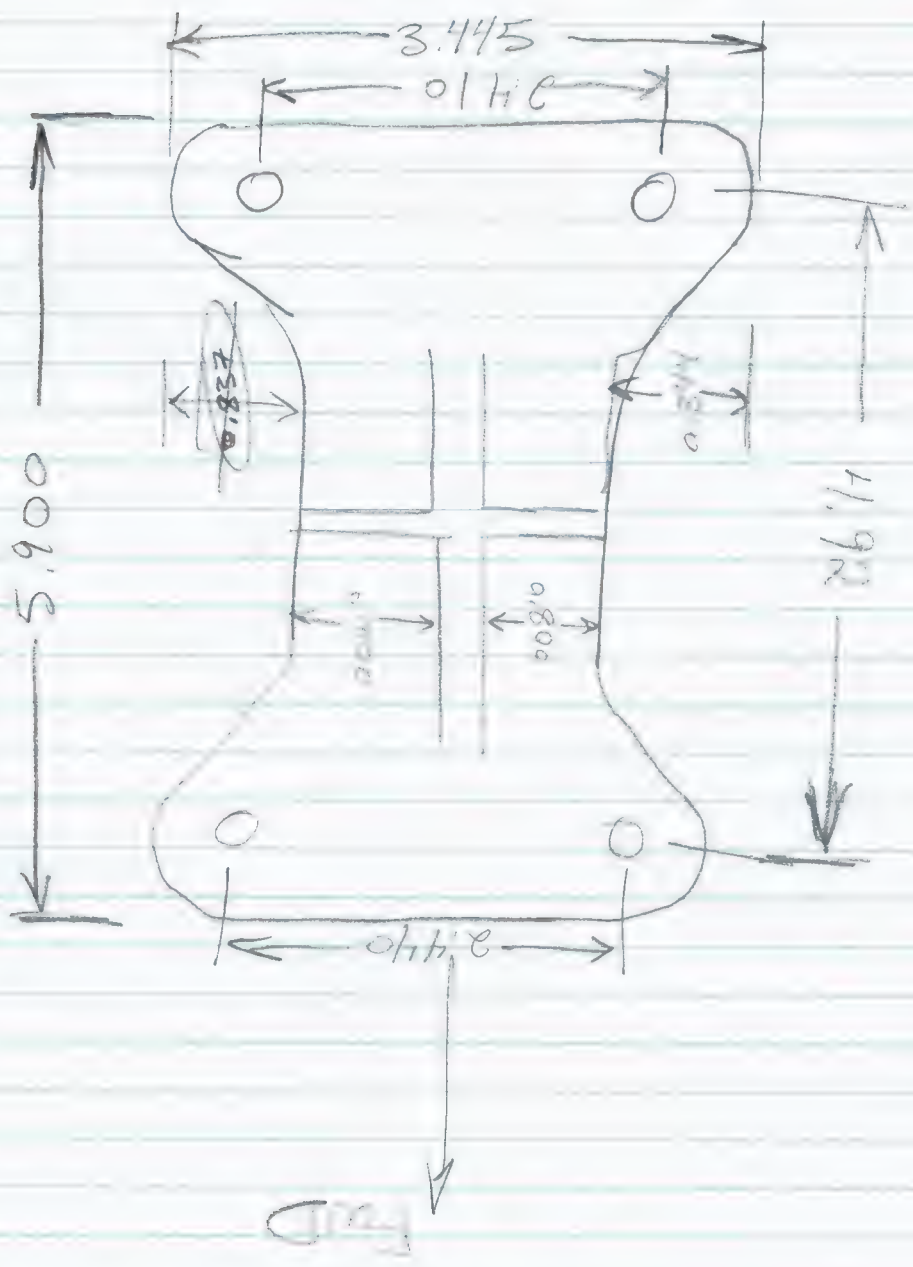
CLAMP UNDER FTG 1.250" WIDE

$$1.25 - .4655 - .4765 = 0.308$$

$$\text{CLAMP SPACING} = 0.308"$$

.4655	1.25
4765	0.942
0.9420	0.308

C-CLAMP BOLTS ARE 4.50" APART
 5.482" LONG OVERALL
 FOLANSE 150.312" THICK
 ARCH 15 0.312" THICK

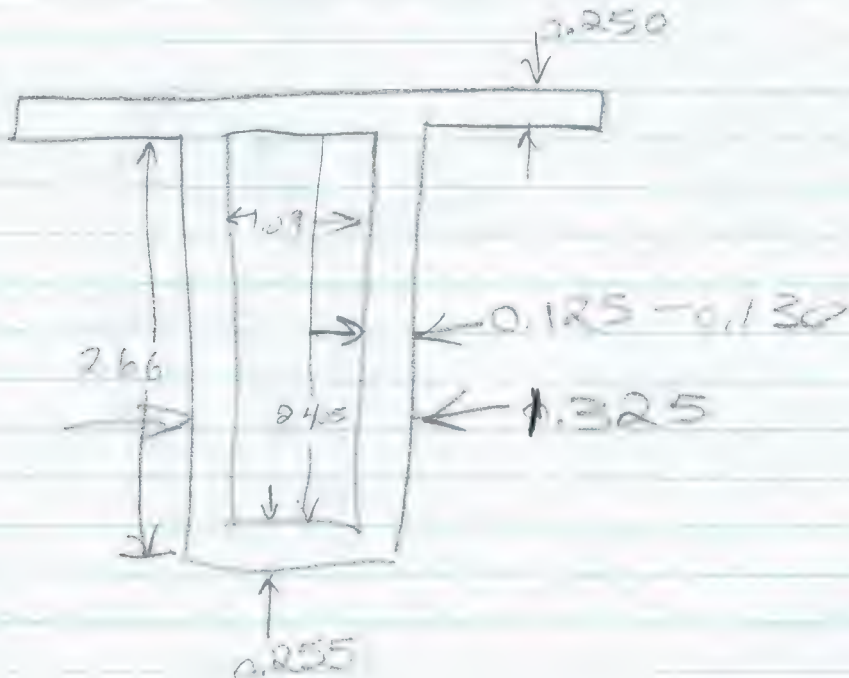




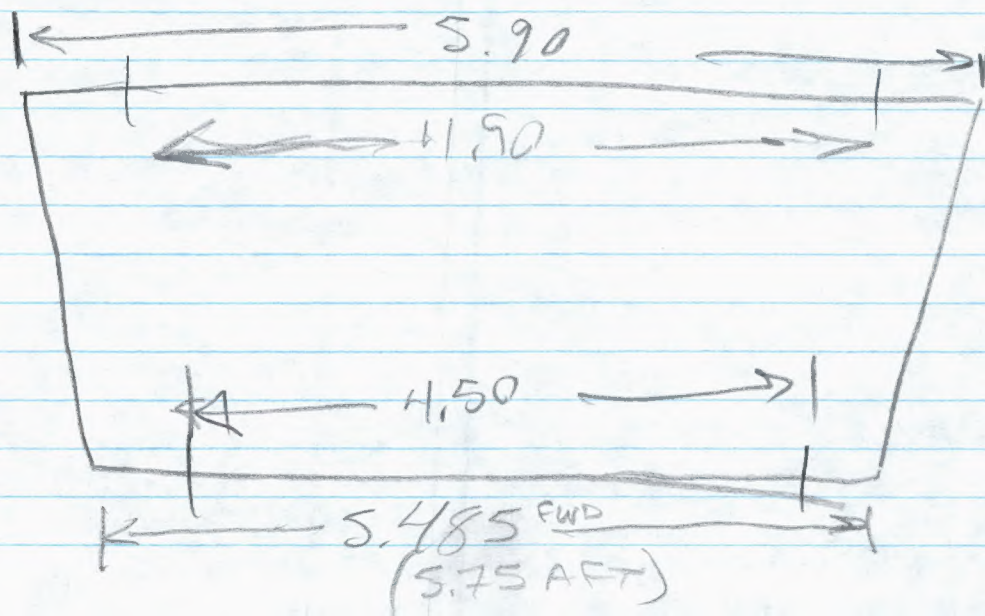
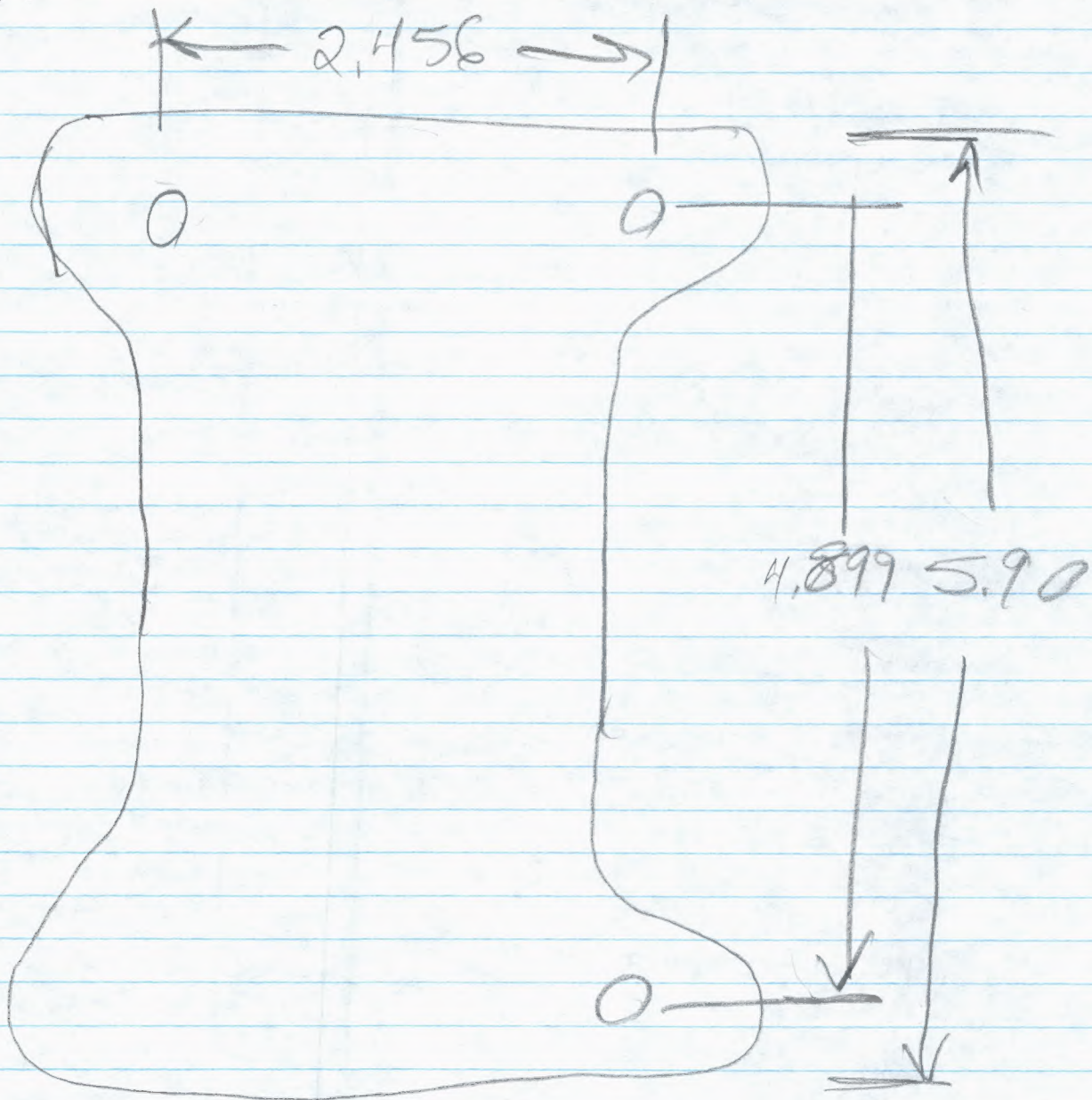
2x CLAMP
4x FSG

0.497 LEAD A/E
0.45 LEAD A/E

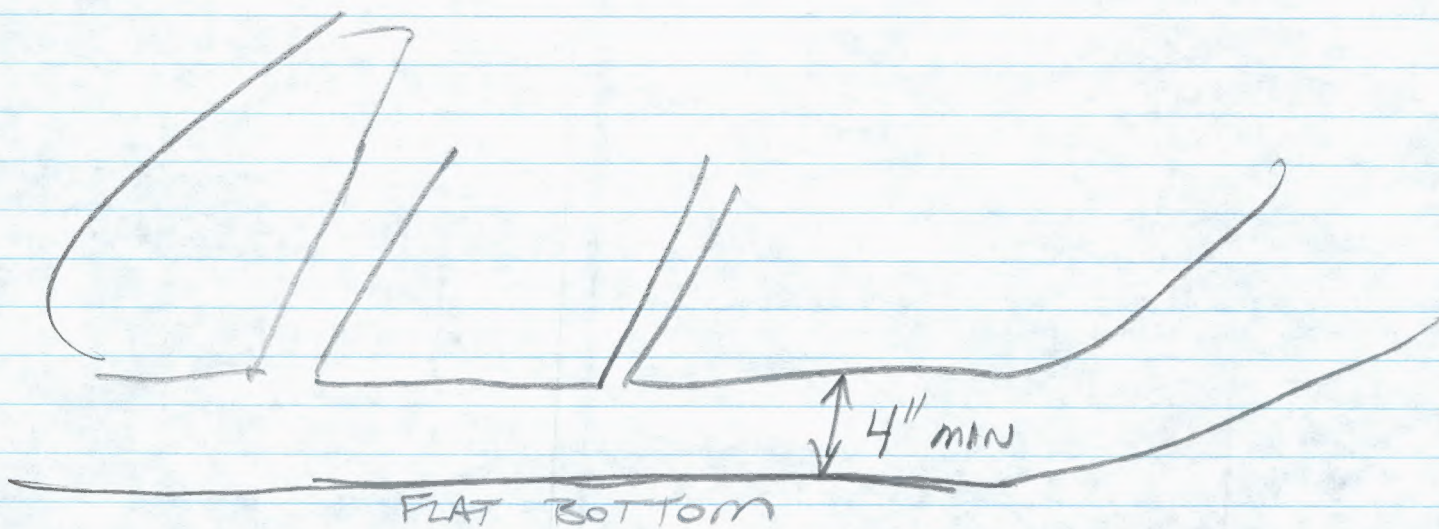
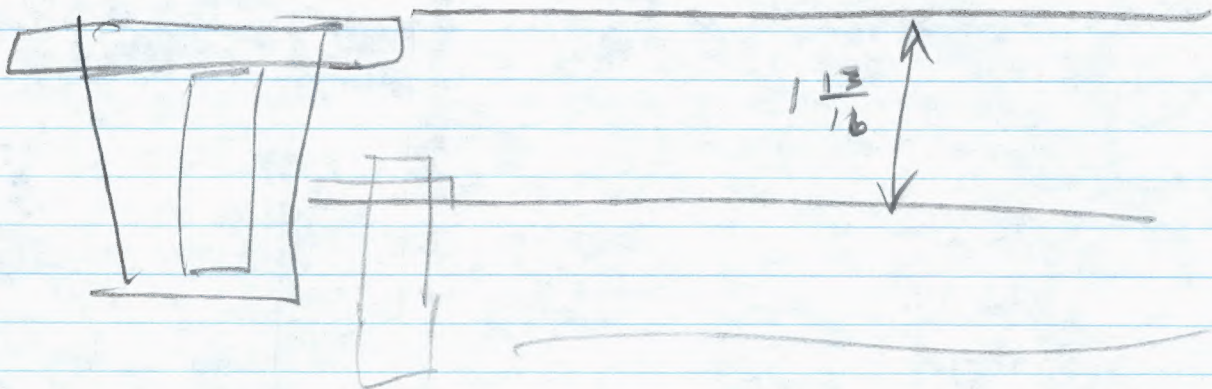
FWD ATTACH 206-033-08-001A



FWD.
FTG. ALL BOLT HDS .45" A/F



FWD. FIG.



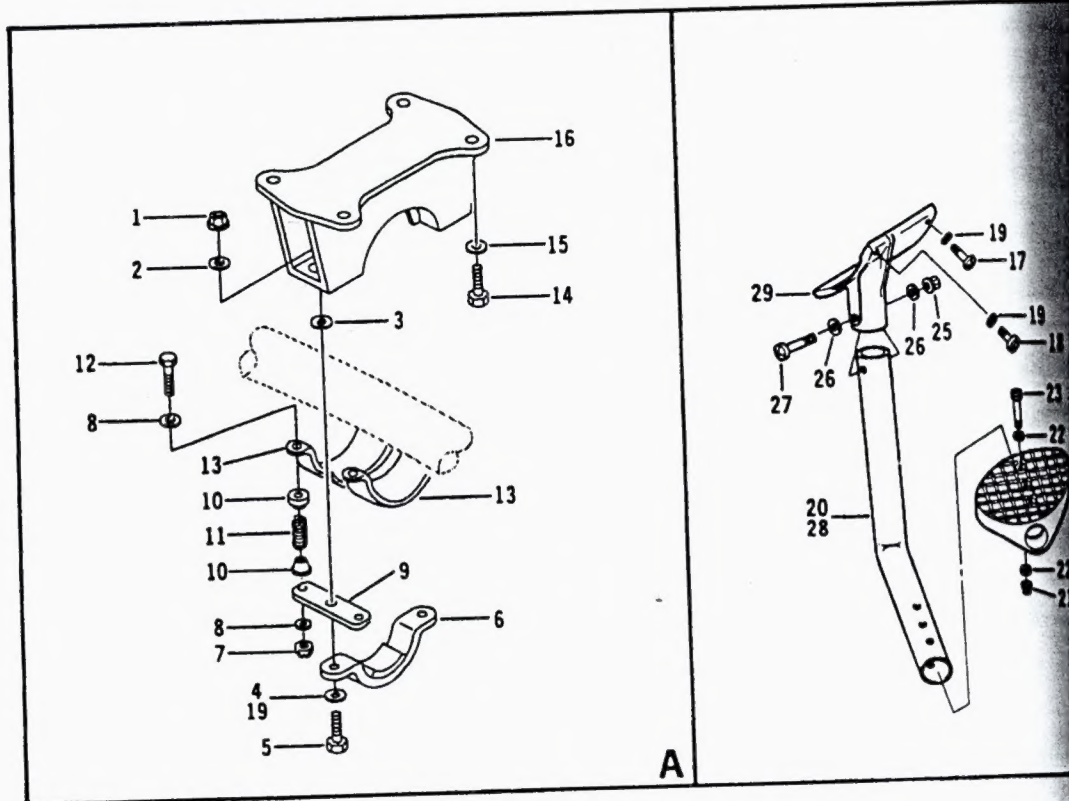
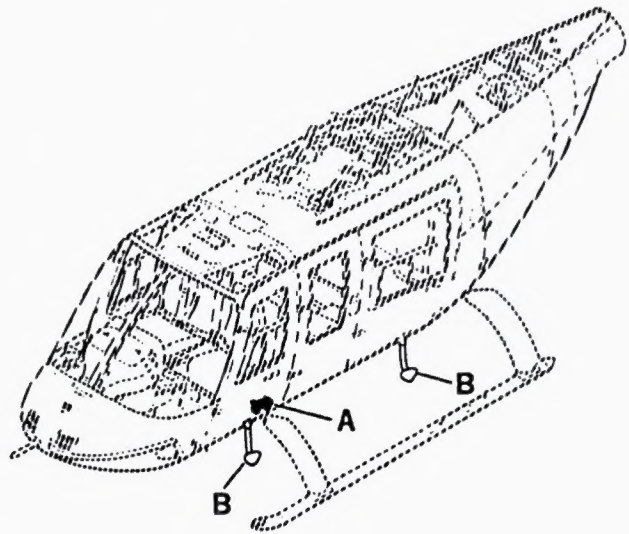


Figure 32-4. Skid gear kit, high and low; support, landing gear, aft (S/N 45004 thru SUB, 4660 SUB)

PART NUMBER	(3) ITEM NAME	UNIT PER ASSY	(5) A V A I L	(6) U O C
	FIGURE: 32-4. Skid gear kit, high and low; support, landing gear, aft (S/N 45004 thru SUB, 46601 thru SUB, 51001 thru SUB)			
206-706-003	SKID GEAR KIT, HIGH (NOTE 1) (SEE FIG. 3 FOR BALANCE OF BREAKDOWN) (REPLACED BY 206-706-064-103 AND -105)	REF		A
206-706-101	SKID GEAR KIT, HIGH (SEE FIG. 3 FOR BALANCE OF BREAKDOWN) (REPLACED BY 206-706-064-103 AND -105)	REF		B
206-706-103	SKID GEAR KIT, HIGH (SEE FIG. 3 FOR BALANCE OF BREAKDOWN) (REPLACES 206-706-064-003 AND -101) (REPLACED BY 206-706-064-105)	REF		
206-706-105	SKID GEAR KIT, HIGH (SEE FIG. 3 FOR BALANCE OF BREAKDOWN) (REPLACES 206-706-064-003, -101 AND -103)	REF	1	
206-706-103	.NUT (USBL ON 206-706-064-103 AND -105)	4	1	
206-706-103	.WASHER (USBL ON 206-706-064-103 AND -105)	4	1	
206-706-103	.WASHER (USBL ON 206-706-064-103 AND -105)	4	1	
206-706-103	.WASHER (USBL ON 206-706-064-103 AND -105)	4	1	
206-706-103	.BOLT (USBL ON 206-706-064-103 AND -105)	4	1	
206-706-103	.STRAP ASSY, CROSS TUBE, LANDING GEAR (USBL ON 206-706-064-103 AND -105)	2	1	
206-706-103	.NUT (USBL ON 206-706-064-103 AND -105)	8	1	
206-706-103	.WASHER (REPLACED BY NAS1149F0332P) (USBL ON 206-706-064-103 AND -105)	16		
206-706-103	.WASHER (REPLACES AN960-10L) (USBL ON 206-706-064-103 AND -105)	16		
206-706-223-001	.SPACER (USBL ON 206-706-064-103 AND -105)	4	1	
206-706-4	.WASHER (USBL ON 206-706-064-103 AND -105)	16	1	
206-706-188	.SPRING (USBL ON 206-706-064-103 AND -105)	8	1	
206-706-16D	.BOLT (USBL ON 206-706-064-103 AND -105)	8		
206-706-222-007	.SUPPORT ASSY (USBL ON 206-706-064-103 AND -105) 206-706-064-103 AND -105)	4		
206-706-5	.BOLT (USBL ON 206-706-064-103 AND -105)	8	1	
206-706-16-17B4	.WASHER (USBL ON 206-706-064-103 AND -105)	8	1	
206-706-108-001	.FITTING (USBL ON 206-706-064-103 AND -105)	2	1	
206-706-370-009	.STEP INSTL, FWD, LH	1		
206-706-370-010	.STEP INSTL, FWD, RH	1		
206-706-370-003	.STEP INSTL, AFT, LH	1		
206-706-370-004	.STEP INSTL, AFT, RH	1		
206-706-4-13	..SCREW	2	1	
206-706-4-13	..SCREW (USBL ON 206-031-370-009 AND -010)	2	1	
206-706-4-15	..SCREW (USBL ON 206-031-370-003 AND -004)	2	1	
206-706-416	..WASHER (REPLACED BY NAS1149D0463J)	4		
206-706-463J	..WASHER (REPLACES AN960JD416)	4		
206-706-370-005	..STEP ASSY, FWD, LH	1	1	
206-706-370-006	..STEP ASSY, FWD, RH	1	1	
206-706-370-007	..STEP ASSY, AFT, LH	1	1	
206-706-370-008	..STEP ASSY, AFT, RH	1	1	
206-706-42L3	...NUT	3	1	
206-706-10L	...WASHER (REPLACED BY NAS1149D0332J)	6		
206-706-332J	...WASHER (REPLACES AN960JD10L)	6		

CHAPTER 52
DOORS AND WINDOWS

CHAPTER 53
FUSELAGE

206-073-108
-001